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DRAFT
Operational Requirements Document

Aerospace Command and Control
And
Intelligence, Reconnaissance, Surveillance Center
AC2ISRC (USAF) 401-98

TIME CRITICAL TARGETING (TCT) FUNCTIONALITY
(a.k.a. TCT CAPABILITY or TCT Cell)

ACAT III

Prepared for Milestone 2 Decision

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(See Distribution)

1. General Description of Operational Capability.

1.1   Mission Need

Required: "A capability responsive to the need to engage fleeting, mobile targets of such importance that they impact the joint force commander's ability to conduct the mission. This includes a detect-to-engage timeline which is faster than the enemy's timeline to conduct an attack." MNS for TAMD, JROCM 065-99[1]

This ORD defines the construct of an enhanced *Time Critical Targeting (TCT) Functionality.* Approved joint terminology recognizes the term time sensitive targeting, or TST, but does not yet include joint recognition of the term TCT. The Joint Theater Air and Missile Defense Organization (JTAMDO) has submitted a proposed definition for TCT as a specific subset within TST. Both definitions extend the above JROCM 065-99 requirement statement to accommodate *any* target, whether fixed or mobile, within the categories of time sensitive or time critical as determined by battlespace situation and Joint Force Commander's guidance. On the basis of the contrast between both definitions, however, TCT will be used in this document as the more appropriate term to describe needed capability for the warfighter.

Definitions

Time Sensitive Target (TST) – *Targets requiring immediate response because they pose (or will soon pose) a clear and present danger to friendly forces or are highly lucrative, fleeting targets of opportunity.*   (JP 1-02, DoD Dictionary)

Time Critical Target (TCT) – *A time sensitive target with an extremely limited window of vulnerability or opportunity, the attack of which is critical to ensure successful completion of the JFC's operations. By definition, TCTs rank high on the Joint Integrated Prioritized Target List.*   (proposed JTAMDO expansion of TST)

TCT Functionality is needed to augment tactics, techniques, and procedures (TTP) for dynamic C2 of aerospace and other theater assets in support of Joint Force Commander (JFC) prosecution of surface time critical targets (highest priority surface Time Sensitive Targets). These targets are JFC-designated enemy fixed and mobile surface objects presenting a near-term challenge to friendly force initiative and to full spectrum dominance in the battlespace. TCTs have been commonly associated with adversary theater missile (TM) and suppression of enemy air defense (SEAD) capabilities; however, other emerging circumstances such as a personnel recovery situation, a key enemy C2 or communications node, or dropping a bridge to control enemy movement may fit JFC Guidance for TCTs. TCTs evolve within the current joint force planning cycle and cannot therefore be fully accommodated by preplanned activity in an air or integrated tasking order. *Any* unplanned or immediate target recognized within the current plan execution time period as a direct challenge to or extraordinary opportunity for joint force progress toward JFC objectives must be considered for designation and response as a TCT.

TCT Functionality can be either a physical concentration of individuals and equipment in a "cell" or a virtual collaboration using coordination tools and TTP.

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[1] *Mission Need Statement (MNS) for Theater Air and Missile Defense (TAMD)* JROCM 065-99, 7 Jul 99

1.2 Mission Area

TCT Functionality supports an Operational Level of War approach to C2 of forces in meeting the theater-wide challenge of TCTs through the Joint Force Air Component Commander (JFACC). The JFACC typically deploys to theater the preponderance of ISR assets, along with the far ranging and rapid strike weapons assets, plus the theater-wide C2 perspective for the joint targeting planning and execution against TCTs. Furthermore, operating from the joint or combined air operations center (JAOC or CAOC), the JFACC leverages resident liaison detachments and elements of the other component command centers and coalition partners for collaboration and coordination to effect combined force dominance over TCTs. The TCT Functionality focuses upon material improvements to augment processing methodologies at the JAOC (and potentially to other subordinate command centers) to:

- differentiate TCTs from other targets and clutter in the battlespace,
- collaborate with component liaisons on development of courses of action against TCTs,
- aid decision making, and
- implement the chosen action.

Where JFC may not choose a USAF senior leader as JFACC, the Air Force Component Commander may still support theater objectives with the TCT Functionality.

1.2.1 Capability for TCT prosecution supports the several following Office of the Undersecretary for Defense (Acquisition & Technology) Mission Areas:

Primary

#220	Air Warfare
#227	Air Warfare Surveillance and Reconnaissance
#221	Counter Air
#223	Close Air Support and Interdiction
#224	Defense Suppression

Secondary

#210	Land Warfare
#217	Land Warfare Surveillance and Reconnaissance
#212	Indirect Fire Support
#214	Ground Based Anti-air and Tactical Missile Defense

#230	Naval Warfare
#237	Naval Warfare Surveillance and Reconnaissance
#231	Anti-air Warfare
#232	Amphibious, Strike, and Anti-surface Warfare

#240	Theater Nuclear Warfare
#242	Theater-wide Theater Nuclear Warfare
#276	Defensive Chemical and Biological Systems

#340	Theater and Tactical Programs
#341	Theater Command and Control
#344	Tactical Command and Control
#345	Tactical Communications

Tertiary

#110	Strategic Offense

#120   Strategic Defense

1.2.2   Companion Operational Requirements Documents

All Source Analysis System (ASAS) ORD, US Army, Mar 97.
Contingency Theater Automated Planning System (CTAPS) ORD, TAF 305-88, Mar 95
Combat Intelligence System (CIS) ORD, CAF 306-93-I-A, Jan 95
Theater Battle Management Core Systems (TBMCS) System Version Requirements
      Document, SVRD
Draft *Theater Battle Management Core Systems (TBMCS) ORD,* May 00
Draft *Battle Command System (BCS) ORD,* Sep 99
Family of Systems Requirements Document (FSRD) for Defeating Theater Time Critical Targets,
      AC2ISRC (USAF) 401-98, 11 Jan 00;
Capstone Requirements Document (CRD) for Theater Missile Defense, USACOM, 1 Jul 98.
TCT Functionality fully supports the joint warfighting intent of the JROC Memo 065-99, *MNS for TAMD*, 7 Jul 99, as well as the Multi-service Tactics Techniques and Procedures publication *MTTP*: *Targeting: The Joint Targeting Process and Procedures for Targeting Time-Critical Targets,* Jul 97.

1.3   Proposed System

The TCT Functionality will enhance TBMCS services and become an integral part of the major C2 nodes of the joint theater air control system (TACS) operational system, whether surface based or airborne. TCT Functionality will be an essentially *dependent* configuration of integrated software applications on common workstations, servers, and necessary modules to interface with the in-place communications of the supported C2 node, primarily the JAOC. TCT component parts will feature "plug and play" capability to draw from the C2 node's existing support infrastructure for power, connectivity, and data support. In evolutionary acquisition this may not be immediately possible, but TCT-specific or individual equipment and services support should be only as initially required for functionality and must have a migration path to future utility vice throw away status. TCT Functionality will conform to the rapidly deployable, small footprint construct of the expeditionary Air Force (EAF). At the same time, an accommodation must be made for graceful degradation in TBMCS or other support to TCT Functionality (particularly NRT database segments on TCT servers, alternate communication paths to receive MTI feeds or to task assets, etc.). This will allow continued processing of available TCT information as the operator may see fit to employ and to satisfy key performance parameters.

1.4   Missions

The tools described in this ORD will support real-/near-real time human-in-the-loop (HITL) data access and manipulation to support decision making and asset tasking for rapid, accurate prosecution of specific TCTs. TCT Tools products will also support routine planning but primarily will support operator activity during the ATO execution phase against TCTs in six broad but mutually interdependent categories:

- Time Critical Target Awareness Enhanced Workstation processing and battlespace display (correlated, multi-source targeting display; interface and product display of other TCT applications; include ISR Collections Management display to support evaluation of the collections plan for making requests to increase knowledge on potential TCTs),
- Area Limitation and Terrain Analysis (scope required intelligence, surveillance and reconnaissance search volume),

- Automated TCT Intelligence Preparation of the Battlespace (IPB development and utilization),
- Automated Weapon-to-Target Pairing (rapid calculation of weapon assignment options),
- Launch and Impact Prediction plus Nuclear, Biological, Chemical Dispersion Prediction, and
- Joint Target Collaboration and Execution (coordinate joint target development and weapon tasking).

These decision aids will aid the warfighter to: 1) rapidly acquire, manage, exchange, and understand the large volume of relevant information; and 2) respond and adapt, faster than any adversary, to war's dynamics, uncertainties and ambiguities.

1.5   Operational Concept

The TCT Functionality consists of trained operators and equipment within the Joint or Combined Air Operations Center (hereafter called JAOC). The JAOC is the senior C2 nodal element of the joint theater aerospace control system (TACS). Adjunct capability at the next subordinate node, the Battle Control Center, formerly know as the CRC will offer flexibility for distributed TACS collaboration or delegation of portions of the TCT activity, particularly when warranted by span of control (task saturation) or as a backup and alternate location capability for prosecuting TCTs. These nodes support ready access to:

- JFACC and delegated agent command authority,
- Connectivity for all-source intelligence, surveillance, and reconnaissance (ISR) data, as well as centers for analytical support (primarily through Theater Battle Management Core Systems [TBMCS] / Global Command And Control System Air Force [GCCS-AF] web-based networking),
- Liaison elements for joint and coalition forces coordination (both resident at AOC and through TBMCS/GCCS-AF to other service equivalent networks), and
- Visibility into joint force disposition (composite tactical picture/joint data network) plus connectivity for asset tasking (datalinks and voice).

Key portions of TCT Functionality herein described should also be ultimately installed and employed from airborne elements of the TACS such as E-3 AWACS and E-8 JtSTARS. This will depend upon evolving concepts of operation and employment for the future TACS as well as physical and technical limiting factors as may determine AETACS full employment of TCT Functionality.

1.6   Support Concept

TCT Functionality is intended to augment existing TBMCS hardware and software capabilities. TCT additional hardware and software applications will fall under the same maintenance management and support concept employed for TBMCS.

1.7   C4ISR (IERs) Operational Concept

TCT Functionality focuses upon *interface* and *compatibility* with TBMCS databases, services, and connectivity as an interim step to satisfy JFACC need for rapid targeting assessment and prosecution capability. Where interface cannot be provided, such as to available moving target indicator (MTI) or other real- to near-real time sensor data, a separate item of equipment will be required to ensure sensor and intelligence information flow to the TCT operators. Evolution of TCT Functionality should, the same as TBMCS, aim toward complete integration into Global Command and Control System-Air Force capability.

1.8 Benefits of Evolutionary Acquisition

TCT Functionality will follow a spiral development methodology with these process benefits:
- (1) the prototyping and packaging of the COTS/GOTS hardware into efficient mobility packages;
- (2) development of software solutions to provide existing and evolving operations capabilities on new equipment; and
- (3) development of new common C2 software plus integration of new capabilities and enhancements to meet emerging threats or capitalize on technical developments.

TCT will field to the warfighter as a ready to employ package of enhancements to critical surface targeting capability at JAOCs (follow-on to other TACS nodes supported in TBMCS). To do this, first, hardware and software integration work will be accomplished in the Software Integration Facility for Time Critical Targeting (SWIFT) at Electronic Systems Center. As prototype and follow-on increments progress, they will be installed at the Dynamic Battle Control Center (DBCC) at Nellis AFB for operational evaluation and developmental feedback. DBCC will also focus upon training and TTP development for the C2 warfighter.

2. Threat

2.1 Threat to Be Countered

Certain potential fixed or mobile targets that could present an immediate challenge to coalition dominance of the battlespace constitute the threat for which TCT Functionality is required. The attributes of such enemy facilities or systems generate targeting uncertainties during Tasking Order planning that preclude the specific assignment of weapon, time, and location for strike or exploitation as a fully preplanned mission (time and place-certain). Such target(s) must therefore be rapidly categorized as time critical for exploitation or destruction as they are sought out and detected during Plan execution, overcoming enemy camouflage, concealment, and deception masking of the time and place of their employment. As previewed in Section 1, the JFC establishes the objectives and guidance that define TCTs.

2.2 Threat Environment

The relationship of TCT Functionality to the critical theater C4I capabilities of the host TBMCS system indicates a high profile target to potential threats. A full range of hostile threat systems (ground-based, airborne, or sea borne) may be employed to destroy or degrade this capability. Specific threats include: physical destruction, electronic countermeasures/electronic support measures (ECM/ESM) threats, intrusion and deception, chemical and biological weapons, and electromagnetic pulse (EMP) threat from nuclear weapons. For details, refer to "Threat Support Document: Worldwide Threat to Airbases, 1991-2000," DST 2660FT-265-92 and "The Electronic Combat Threat Environment Description," DST 2660F-731-92.

3. Shortcomings of Existing Systems and C4ISR Architectures

Recent operations highlight the inability of the current family of systems (FoS) architecture, equipment, and tactics, techniques and procedures (TTP) to adequately support a time critical targeting environment. SCUD TEL and infrastructure hunting in Iraq, attempts to suppress artillery fires and movements in Bosnia, plus the effort to expose and engage mobile military targets in Kosovo ("tanks under trees," surface-to-air missile TELs) illustrate the current FoS shortfall. These experiences define a *requirement for quick reaction, yet highly discriminate targeting, plus avoidance of collateral or unintended damage despite poor weather and*

adversary countermeasures. The current joint FoS is well postured for success in longer lead time, preplanned targeting via the joint Air Tasking Order process; however, *uncertainty* as to the specific what, where, when, how, and why of TCT employment typically places detection of such targets inside the *time* cycle of preplanned operations. Resolving the Uncertainty and Time factors are therefore key in prosecuting TCTs.

3.1 General Systems and TTP Shortcomings

Currently TCTs are prosecuted with human "grey matter" fusion of the available information. This process features many disparate sources in many different formats, yellow sticky pad notes, some face-to-face coordination, but much sneaker net and telephone contact for mission retasking during ATO execution. Coordination with other services through the JAOC liaisons is too slow and time consuming for rapid, mutually supporting, multi-service target development and engagement of TCTs. There is no current standardization of C2 support hardware, software, training, or TTP for countering time critical and time sensitive targets from one contingency or exercise to the next. Lessons are lost over time with personnel transfers or do not easily convey to new augmentees. No sustaining work in development and manipulation of IPB for potential TCT target sets is accomplished, archived, and accessible for use in future contingencies. The limited numbers of individual sensors and weapon systems are deficient in ability to autonomously detect, combat identify, and precisely target TCTs across a theater of operations. ISR and attack assets do not have the coordinating intervention of C2 to effectively cue them for TCT detection. C2 nodes cannot sufficiently correlate or fuse Intelligence, Surveillance, and Reconnaissance (ISR) for target development and identification, determine the best weapon selection within JFC Guidance and rules of engagement (ROE), then task and provide real time information to the cockpit (RTIC) to weapon crews for precise positioning or predictive location and timely attack of TCTs. Experimental or prototype systems used in recent contingencies and exercises operate in "stovepiped," one-of-a-kind mode unsupported for personnel, for training, and for continuing maintenance. Organization and process modifications at the JAOC (and BCC) during these events have facilitated some process improvement through tactics, techniques, and procedures. None of these one-of-a-kind system or TTP "solutions" has been instituted to support future operations or the worldwide Expeditionary Air Force concept.

3.2 Battlespace Visualization and Enemy Course of Action Prediction Tools

The current system does not have tools sufficiently powerful and fast enough to present surface TCTs to the warfighter in context with all other operations or with lead time for consistently effective counter. The JFACC cannot view a single correlated or integrated Common Operational Picture (COP) of surface objects as they are sensed within the battlespace to observe the enemy, to control friendly force employment, and to deconflict multi-service and possible non-combatant entities. Long lead-time tools for collaborative planning are unsuitable to the dynamic pace of "on-the-fly" assessment and modification to either the ATO or collection management plan (CMP) during execution. Single function prototype systems or advanced concept technology demonstrators have been aggregated at our coalition JAOC on an ad hoc basis to improve situation awareness; however, these do not work in an integrated manner to highlight TCT activity and predict enemy courses of action from Intelligence Preparation of the Battlespace (IPB) products. IPB products for specific countries and potential TCT target sets are extremely limited plus current tools for IPB development require extensive operator training and are too slow for intelligence or operations personnel to self-generate robust IPB products for finding and targeting TCTs. In the case of theater ballistic missile targets, commanders lack tools for rapid and precise determination of missile launch points, impact points, and dispersion

patterns of potential nuclear, biological, or chemical warheads to support active and passive defense as well as attack operations.

3.3   Decision Support.

There is no help for the warfighter to sort relevant information from the volumes of available data and develop possible friendly courses of action for fast human-in-the-loop (HITL) decision making. Data overload is a distracting reality supported by our expanding sensor, intelligence database, and communications capabilities. Warfighters do not have the decision tools necessary to support rapid targeting when confronted with more than two or three targets at a time. Hard copy priority lists and ATO planning documents are inadequate to keep pace with dynamic targeting in fluid and rapidly changing operational situations. Such lack of support denies decision makers the capacity for fully flexible command and control of available attack assets without jeopardizing the continuity and purpose of the ATO and other deliberate planning products.

3.4   Personnel.

There is a general lack of dedicated trained personnel for TCT operations. Systems complexity makes qualification training too stringent to enable augmentees to learn targeting and tasking against TCTs immediately before deployment or upon arrival in theater. Operations and Intelligence personnel do not institutionally integrate their respective activities for TCT prosecution. In particular contingency situations this may have been accomplished; however, close collaboration in real- to near-real time targeting has only occurred on an ad hoc basis with associated and repeated learning curve each time.

3.5   C4ISR Operational, System, Technical Architecture Shortcomings

The joint TACS architecture generally supports interoperability in communications and operations between services, but current multi-service and multi-national C4I systems lack standardization and integration for effective time critical targeting. A key need is a real time coordination and collaboration tool to assist both dynamic targeting and weapon assignment among joint and coalition forces. Other issues, not exclusive to TCT Functionality, in communications and network architecture planning and dynamic management also apply, such as: multiple system competition for available bandwidth; multi-level security; numbers of workstations, net worthiness, and certification of equipment on local and wide-area networks; etc.

4. Capabilities Required

This Functionality will be incorporated within the Combat Operations Division (COD) at the JAOC (T) and subordinate joint TACS units (surface and/or aerospace) as may be tasked in support for C2 of TCT missions (O).

4.1   System Performance

People will use TCT Functionality to develop detailed IPB products and provide other input to the planning process for JFC designated TCTs. TCT Functionality must support this process in coordination with other theater and national capabilities. The system visualization and coordination capabilities must allow the user to facilitate real-time deconfliction in execution against TCTs. Operators will use TCT tools to predict and verify location of time critical targets

by accessing and correlating (T) or fusing (O) multiple sensor sources and intelligence database information in a real- and near-real time common operational picture (COP) of the battlespace situation. Predictive planning will allow preemption rather than reaction, enable rehearsal of potential courses of action and evaluation of possible outcomes, and enable rapid adaptation of plans during execution. TCT tools will also allow the user to correlate archived data with real- to near-real time situation displays to provide dominant battlespace awareness of TCTs to commanders and staffs at all levels. The tools must provide a means to review planned collections and update collection management requirements based upon the area of operations to influence deliberate planning as well as execution. TCT Functionality must support cueing of weapons and sensor platforms in near-real time to prosecute time critical targets; this includes sensor tasking and retasking (IAW JFC ROE/Guidance), weapons selection and tasking, and dynamic re-planning. TCT Functionality must further provide common data formats for products that can be stored, retrieved, edited, and disseminated to any and all users in the TBMCS and GCCS architecture within the timelines necessary to defeat time critical targets.

Enhancements for TCT Functionality in this ORD are categorized as follows:
- TCT Awareness Enhanced Processing and Display (TCTA-E) to include ISR visualization and collections management interface,
- Area Limitation and Terrain Analysis Tool (ALTA),
- Automated TCT IPB Tool (ATIPB),
- Weapon-to-Target Pairing Tool (WTP),
- Launch and Impact Point ; Nuclear, Biological, and Chemical (NBC) Dispersion Prediction Tool (LIP/DP).
- Joint Target Collaboration and Execution Tool (JTCE)

### 4.1.1 Mission Scenarios

Peacetime:
The TCT Functionality is used in garrison for operator qualification training and for intelligence collaboration on specific threat system and country analyses to build the IPB products that initialize go-to-war intelligence databases. TCT is further used in distributed mission training and exercises for continuation training of personnel, for theater specific plans rehearsal and TTP evolution, and to familiarize component commanders and staff with the TCT aspect of joint force targeting in the transition and wartime force posture.

Transition and Wartime:
Planning -TCT Functionality provides the JFC with wartime-ready critical targeting flexibility while maintaining a continuity of operations derived from deliberate planning. Trained and practiced personnel use TCT tools to contribute to the ISR collections and target prioritization processes in deliberate planning, to amplify or modify IPB products, and to participate in war-game modeling and evaluation of course of action alternatives. The Air or Integrated Tasking Order then accommodates TCT Functionality as an integral part of the theater strategy, guidance, apportionment and allocation of effort to achieve JFC objectives.

Execution – Personnel employ TCT Functionality to actively seek out TCT targets, to preemptively destroy or suppress them, and to exploit their activity to expose and target their support infrastructure. To highlight potential TCTs, operators employ TCT tools to contrast their continuous evaluation of real- and near-real time sensor feeds against the prepared IPB and other all-source intelligence (TBD, but likely intelligence analysts and targeteers at the JAOC). They use the TCT tools to collaborate with other service and coalition nodes to nominate these potential TCTs for cued examination by available additional ISR assets (through collection

management function) or make direct declaration as a TCT for prosecution IAW JFC Guidance and theater ROE. In further collaboration among service and coalition partners, the TCT personnel determine courses of action, task the best option, and coordinate deconfliction from other theater activity.

TCT Operational Architecture
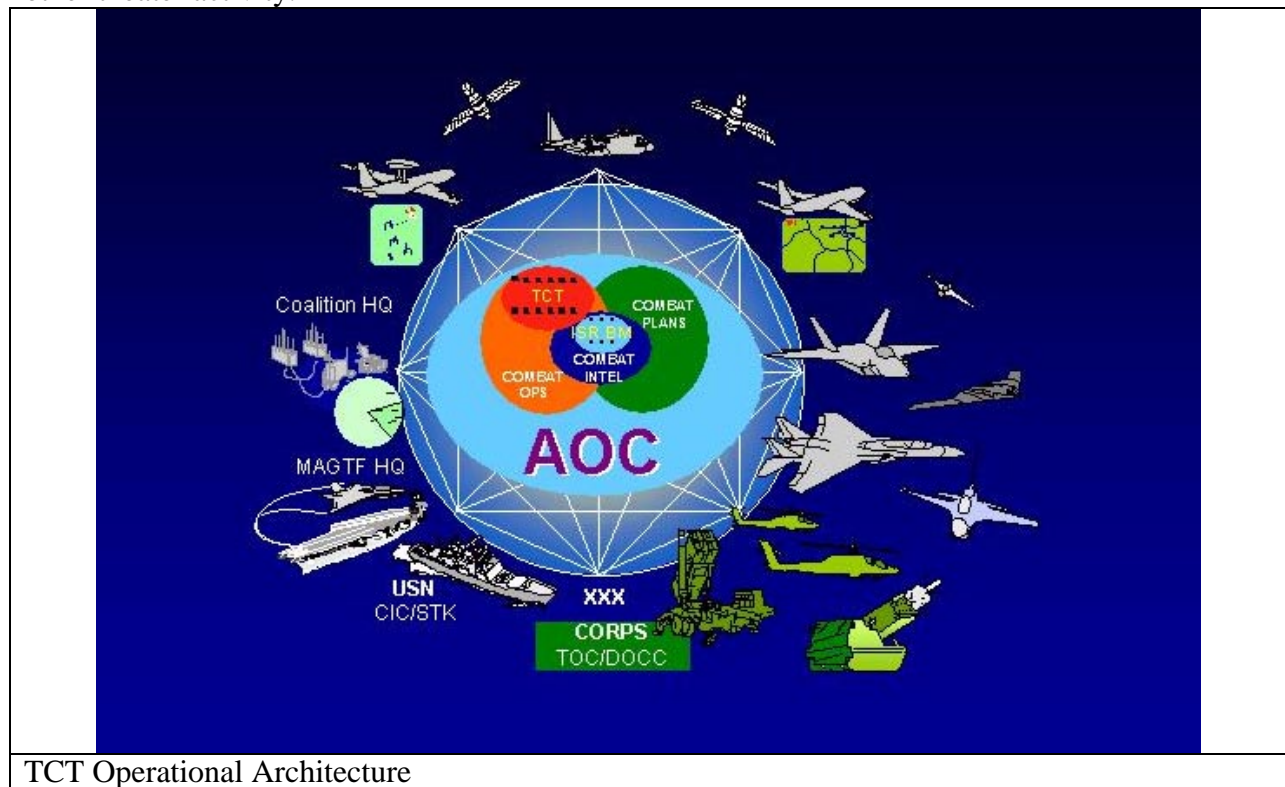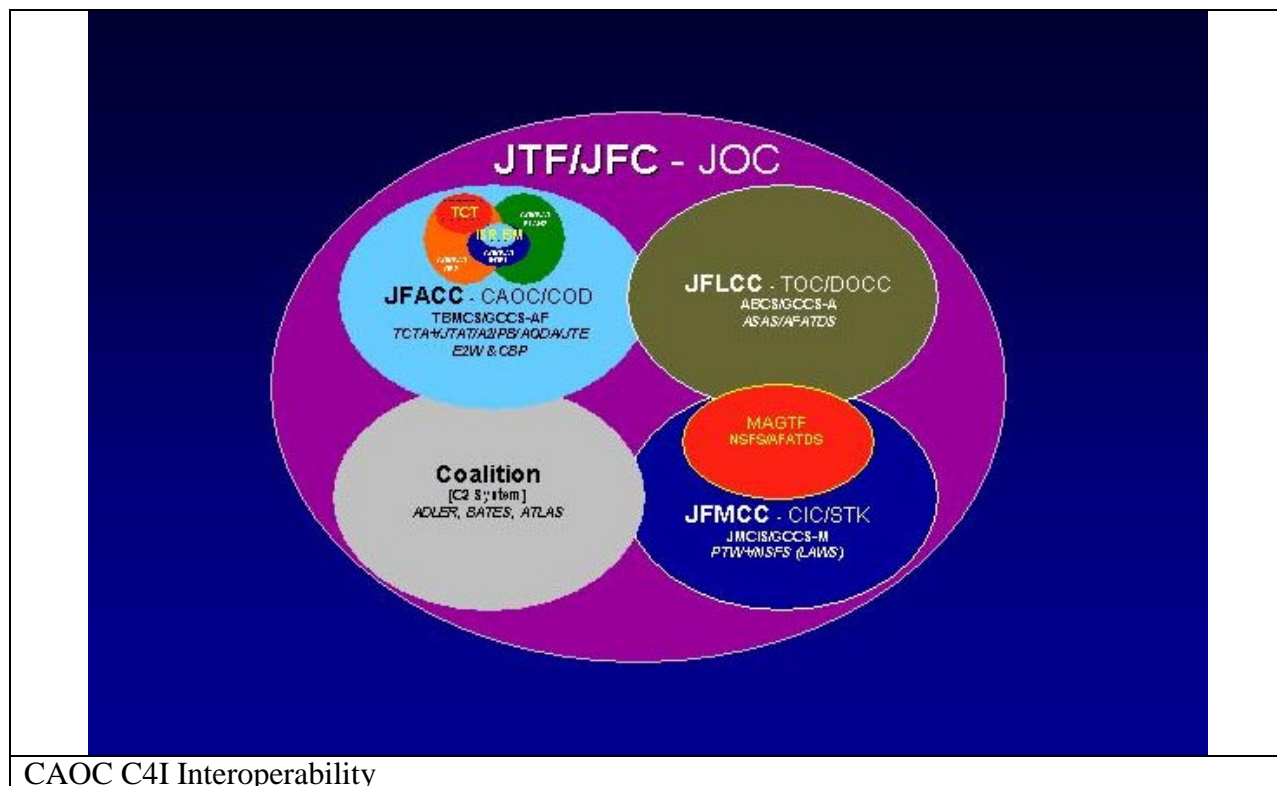
CAOC C4I Interoperability

4.1.2 Specific Performance and KPP Identification

KPP describe components of TCT Functionality without which the stated goal of enhancement to existing TACS capability against TCTs will not be achieved. Joint interoperability of TCT Functionality is a baseline requirement. The following elements are critical and deemed KPPs:

Key Performance Parameter	Threshold and Objective
Interoperability: components of TCT Functionality must accommodate joint and coalition data and message standards for free exchange of information. TCT Functionality must interface with TBMCS/GCCS-AF to leverage services, databases, and wide area connectivity to joint component and possible coalition C2 systems.	T = Interface through TBMCS/GCCS-AF with joint components and coalition partners; employ common information. and communications standards. O = Integrate TCT Functionality within GCCS-AF system capabilities.
TCTA-Enhanced Workstation: provide operator tailorable presentation of all-source sensor and INT information with mapping data for common operational picture (COP) of the battlespace; provide human-system interface to facilitate operator use of all applications for collections visualization and management interface, joint development and designation of TCTs, development of course of action (COA) and decision options, plus implementation of COA and asset tasking.	T = Correlated 2-dimensional picture of R and NRT aerospace and surface activity from multiple sources; operator functional interface to allow tailorable build or suppression of functional elements in common operational display. O = Fused 3-dimensional capable picture with above attributes. --- Data Accessibility for supported applications: T = 2 minutes maximum to extract TCT data

	from any WAN accessible database; 30 seconds maximum to extract archived data from TCT server private datastore. O = 1 minute maximum to extract TCT data from any WAN accessible database; 15 seconds maximum to extract archived data from TCT server private datastore. -- Host human system interface (HSI) with other TCT applications. (T = O) -- Host HSI for two-way voice and data communications within and exterior to AOC for TCT prosecution. (T = O)
Automated TCT Intelligence Preparation of Battlespace: collate, process, publish, and access for "playback" multiple digital IPB products to find, identify, and fix TCTs. Determine NAI and TAI for joint ISR collections and operator decisions against TCTs	T = Capability to generate and use TCT IPB products on TCTA-E. (T = O)
Weapon-to-Target Pairing Tool (WTP): rapidly assess assets, threats, priorities, conditions, guidance and ROE applicable; present to operator for decision the recommended course(s) of action.	T = Capability for operator to use WTP on TCTA-E, migratable to any TBMCS/GCCS compliant workstation. (T = O) -- T = 2 minutes or less from target declaration as TCT to presentation of COA options to the operator. O = 1 minute or less from target declaration as TCT to presentation of COA options to the operator.
Joint Target Collaboration and Execution Tool (JTCE): provide visualization and text description of specific-interest battlespace objects on operator displays to facilitate joint and coalition collaboration for target development plus collaboration, coordination, and deconfliction of best course of action option among assets available.	T = Capability for operator to use JTCE on TCTA-E, migratable to any TBMCS/GCCS compliant workstation. (T = O) -- T = Semi-automated visualization and communication (data and voice) between component C2 nodes to determine TCT status of target O = Automated visualization and integrated digital communication (voice as backup) between component C2 nodes to determine TCT status of target

The system will support simultaneous access to data for and display of the correlated and shared battlespace picture (2-dimensional depiction) at the operator workstations (THRESHOLD). This will include display of sensor and weapons coverage and will be capable of filtering by various techniques (e.g. track type, area of interest, transmission source, geographic and various other attributes) selecting or deselecting track, target, control measure filters. Based on an operator-defined profile, the system will display information in the database on targets, tracks, points, etc. (THRESHOLD) and will display source and confidence of information (OBJECTIVE). The workstations will further provide an embedded communications interface, and a man-machine interface to communications, data, and processing support functions within TBMCS/GCCS and discrete communication capability as may be required outside TBMCS capabilities. The system will therefore provide mapping capabilities which permit electronic overlay of terrain, elevation, latitude/longitude, grid reference, operator entered points (fix marks); and allow the operator to compute multiple bearing and range between points. The system will provide the operator with access to latitude/longitude, Universal Transverse Mercator (UTM) grid, and bearing and range information from requested points. Workstation functions will be Icon/Graphic User Interface (GUI) driven. The workstation will be capable of displaying the Common Tactical Picture (CTP)/Common Operating Picture (COP) of all surface and aerospace activity within the battlespace. **(KPP)**

The system will evolve to provide a 3-dimensional battlefield visualization display of the above functionality (OBJECTIVE).

4.1.3 TCT Awareness Enhanced Workstation Processing and Display (TCTA-E) [KPP*]

Improve functionality of TBMCS-compatible workstation to process, analyze, and display real-/near-real time MTI, SAR, video, and other all-source sensor and INT information with electronic map data for a common operational picture (COP) of aerospace and surface battlespace activity. Facilitate operator use of embedded and other web-based applications or products for joint situation awareness, target development and nomination as TCT, and employment actions against TCTs (using IPB products in finding TCTs, engaging a TCT with selected available weapons, assigning ISR assets; etc) ... all within the available timeline to successfully engage or exploit TCTs. TCT Functionality will interface with TBMCS to draw information from, and contribute information to the TACS COP as well as to leverage other TBMCS databases, information services, and other applications. The system will use and integrate existing COTS/GOTS hardware and software applications, where appropriate, plus joint mandated applications (e.g., CTAPS, TBMCS and GCCS). The system will be able to establish, tailor, store and modify operator profiles and privileges.

> **Threshold:** Correlated 2-dimensional picture of RT and NRT aerospace and surface activity from multiple sensor sources; support operator functional interface with applications for object detection, evaluation and designation of targets as TCT, decision support options for selection by command authority, plus facilitate asset tasking by the operator to reduce target engagement timeline.
> **Objective:** Fused 3-dimensional capable picture with above attributes.

4.1.3.1 TCTA-E include or draw from tools within TBMCS to convert coordinates of items such as target and navigation points from one datum to another. Required accuracy, resolution, datums, and scales are specific to types of targets being analyzed. (T=O)

4.1.3.2 **The system shall be capable of accepting future improvements or changes to NIMA products and databases. (T=O)**

4.1.3.3 **The system should be capable of using commercially provided geospatial data, e.g. data from commercial satellites (LANDSAT, SPOT). This data must be convertible between different map projections, e.g. Space-Oblique Mercator (SOM) to geographic (equal arc-second). (T=O)**

4.1.3.4 **System requires the capability to access, store and retrieve massive volumes of data efficiently (emphasis on XML interface) including: web-based LAN and WAN access among all authorized users, storage, ability to synchronize information and the means to quickly search for specific information using intelligent agents to act on behalf of the user.**
> **Threshold**: Access and retrieve data within 2 minutes.

4.1.3.5 **Objective: Access and retrieve data within 1 minute.System shall provide an automated means to integrate information that is provided in different modes, such as voice, text, and graphics.**
> **Threshold**: Direct data, voice, text, and symbology
> **Objective**: Include speech recognition.

4.1.3.6 **System shall support rapid Modeling and Simulation (M&S) capability (including C3I) and statistical analyses of enemy activity for Situation Assessment and both friendly and enemy COAs and capability to validate the planning alternatives with mission preview and rehearsal. (T=O)**

4.1.3.7 **Software implementation will be such that operator or maintenance personnel can start, restart, terminate, and control system operation including any data base initialization, system harmonization, and functional configuration from the workstation. (T=O)**

4.1.3.8 **System shall provide the capability to display non-destructive (transparent) overlays derived from multiple database or application sources in user definable stacks. Examples follow:**

- Maps with current area of operations boundaries, airspace control measures, topography, lines of communication, etc.; current weather, climatological data, reference gridlines, time zones
- Red and Blue order of battle, current tracks and points,
- IPB information (TCT operating areas, NAIs, TAIs, threat COAs, etc.)
- User selectable and filterable wide area sensor coverage or data (MTI, SAR, UAV Video, ELINT, SIGINT, MASINT, HSI, MSI, SOF reports/ HUMINT)
- Area Limitation and terrain analysis products for selected threat vehicles.
- TCT alerts, target grids, weapon-target pairing line
  > **Threshold**: Operator selectable and filterable 2-D overlays. Store user defined profiles to accelerate man-machine interface.
  > **Objective**: Operator selectable and filterable 3-D overlays. Store multiple user-defined profiles to accelerate man-machine interface

4.1.3.9 System shall provide the capability to alert users of new TCT information that is user defined and filterable (declutter) in terms of TCT activity and priority. The system shall rapidly display correlated (in time and space) all-source data and information. (T=O)

4.1.3.10 Display results from any sensor possessing automatic target recognition (ATR) capability integrated with other sources to enhance specific target identification (ID) and amplifying data. Displayed data should contain all information related to characterization and ID of the TCT; confidence intervals on target characterization and ID should be displayed if sensor(s) or system(s) can compute this information. Tracks confirmed as a "hostile TCT" should be distinguishable on display from other tracks. (O)

4.1.3.11 Provide the ability to quickly access TCT-related, sanitized multi-INT data being fulfilled by national assets to the AOC.
> **Threshold**: Provide data within two minutes of identifying TCT related activities.
> **Objective**: Provide data in RT.

4.1.3.12 TCTA-E will host or provide interface with the ISR Battle Management Tool (or other fielded collections management application) to aid the operator in visualizing Collections Management Plan coverages and coordinating with the Collections Manager for possible tasking and re-tasking of ISR assets to support time critical targeting. (T=O)

4.1.3.13 Provide interface to access JFC and Component CC intentions, guidance, and ROE for user review and use by TCT applications for use during TCT planning and execution processes. (T=O)

4.1.3.14 System shall accept, process, display and directly store or have access to RT/NRT inputs for current display and history playback (estimated maximum two weeks data) from all sources including Tactical Related Applications (TRAP) Data Dissemination System (TDDS) broadcasts; Tactical Information Broadcast System (TIBS); Tactical Digital Information Links (TADIL) A, B, and J; Army Tactical Data Link (ATDL-1); Surveillance and Control Data Link (SCDL) or SCDL Echo; and Image Product Archive (IPA). (T=O)

4.1.3.15 User must be able to access and display target data (e.g. symbology, lat/long) with associated details.
> **Threshold:** User has the ability from both text-based and map-based user interfaces to manually query database and pull for display the target type, classification, identification, and dwell time, and if applicable, heading, altitude and speed of target.
> **Objective**: Provide automated query and an animated display of the moving target and its predicted path; include target type, classification, identification, dwell time, and if applicable, heading, altitude and speed of target.

4.1.3.16 System must provide interface to transmit/receive communications via datalink, voice, video, and text. (T=O)

4.1.4 Area Limitation and Terrain Analysis Tool (ALTA)

TCT Functionality will facilitate analysis to identify possible TCT operating areas and usable LOCs including movement projection, observation refinement, terrain suitability, and terrain masking analysis. System shall project TCT locations based on initial location estimate, predict and provide a means to identify the most likely locations and deployment states of TCTs based on single or multiple observations, and consider various TCT parameters for on and off road vehicle movements. Consider a wide range of TCTs including but not limited to: Theater missiles (launch, hide, move, and reload areas); Mobile missile support sites; Armor (move, hide, rearm, refuel sites); Elements of fire support; Self-propelled artillery; Mobile air defense sites (SAMs).

4.1.4.1 Products of the area limitation and terrain analysis must be timely and presented to the user in a standardized overlay format, preferably graphical, to support target development and execution applications, variety of strike platforms, and weapon systems.

> **Threshold**: manually initiated new analysis of 100 x 100 Km area within 10 minutes; quick reaction 10 x 10 Km area "chip" of previous analysis within six (6) seconds, new analysis of same 10 x 10 Km area within 1 minute
> **Objective**: automated analysis as above initiated on target declared TCT, any point derived from reports associated with TCT parameters.

4.1.4.2 Provide the capability to manipulate Digital Terrain Elevation Data (DTED) and other standard NIMA geospatial products (e.g. Foundation Feature Data, Digital Topological Data, digital raster and vector data) at the workstation.   Datum standard will be WGS-84. Provide the capability to load and manipulate standard NIMA, United States Geological Survey (USGS), Geospatial Information (GI) data (including but not limited to DTED, DFAD, ITD, FFD, MSDS, CADRG, DCW, CIB, LANDSAT, SPOT, etc.) and available commercial products.

> **Threshold**: Accept and manipulate CADRG up to DTED Level 3.
> **Objective**: Accept and manipulate all NIMA, USGS, and GI up to DTED Level 5.

4.1.4.3 Provide the capability to display weather and climatologic data derived from standardized databases, and incorporate data into analyses and predictive capabilities. (T=O)

4.1.4.4 Provide the capability to identify and measure terrain line of sight analysis in full view from a known point to include environmental effects. System shall consider, but not be limited to, assessing the following effects on TCT operations: land class, soil, foliage conditions, concealment, terrain accessibility, including terrain slope, vehicle type, mobility by land class, the effect of weather and seasonal changes; effects of local traffic on mobility; Battle Damage Assessment; Lines of Communication (LOCs); ability of the terrain to support TCTs primary function (e.g. TMs within range of threat targets); ability of adjacent terrain to support TCT operations. (T=O)

4.1.4.5   Create detailed, scaled slope and elevation terrain profile line drawings and associate these with other vector and raster graphics or imagery files. (T=O)

4.1.4.6   Create comprehensive mobility analysis products based on standard DIA MEPED equipment characteristics for specific tracked and wheeled vehicles . Display overlays as a representative probability the TCT could be at that location. Include weather's effect on cross-country mobility.

> **Threshold:** Three (3) percentile valuations (go, no go and difficult)
> **Objective**: Ten (10) percentile values (0 – 100) with user-defined criteria for data display.

4.1.4.7   Create time projections of likely TCT movement along variably set distances with the ability to overlay technical capabilities with demonstrated or hypothetical doctrine and TTP templates. Display results graphically. (T=O)

4.1.5   Automated TCT IPB Tool (ATIPB) [KPP]

Support ability of operators to collate, process, publish, and access for "playback" IPB products; that is, use with the COP on TCTA-E, multiple digital IPB products to find, identify, and fix TCTs, both current location and probable future location for engagement. Operators use ATIPB to determine and display Named Areas of Interest (NAIs) and Targeted Areas of Interest (TAIs), Target Nomination Indices, and threat Courses of Action (COA). This supports the operator with preplanned and dynamic retasking of joint ISR collections against TCT target elements, for reconnaissance of personnel recovery escape and evasion areas, and to estimate enemy timetable and intent. Operators further use ATIPB products in playback mode interfacing with R/NRT sensor feeds in the COP and the JFACC Guidance and ROE. Enemy movements or specific intel reports related to NAI and TAI should trigger operator alerts for closer scrutiny and decision for further action; application should provide for evidence accumulation to operator defined threshold of target nomination as TCT.

4.1.5.1   Create pre-hostility TCT IPB databases for threat countries for a given scenario ("strategic option"). Update, maintain, and use TCT IPB database as real world situation evolves from peacetime to contingency or full wartime footing. (KPP)* Use IPB process, methodology, and product definition based upon Army FM 34-134 and AFJPAM 10-225 pending publication of Air Force Instruction (AFI) on IPB. (T=O)

4.1.5.2   Develop and manipulate TCT specific IPB products according to operator instruction to support time critical targeting. Use Army FM 34-134 and AFJPAM 10-225 product definition pending publication of AFI on IPB.

> **Threshold**: Support complete products generation on 12 hour cycle; updates every 90 minutes.
> **Objective**: Support complete products generation on 8 hour cycle; updates every 60 minutes.

4.1.5.3   Provide new published product notice to the TBMCS network. (T=O)

4.1.5.4 Provide alert or cue to operator for closer scrutiny or decision on further action as individual targets correlate to NAIs or TAIs and JFACC Guidance and ROE. Alert operator as COP composite, automated target recognition, and Intel report evidence correlates/fuses to operator selectable threshold for TCT nomination decision.

> **Threshold**: Provide operator alert through TCTA-E display on targets approaching or arriving at IPB'd NAI or TAI.
> **Objective**: Support operator with correlated or fused evidence accumulation on targets through TCTA-E display and an alert as threshold for TCT nomination is achieved.

4.1.6 Weapon-to-Target Pairing Tool (WTP) [KPP*]

Rapidly assess currently available and near-term planned assets, threats, environmental conditions, JFACC Guidance and ROE applicable to the current TCT, then develop and present to the operator for decision the prioritized recommended course(s) of action for countering the TCT.

> **Threshold:** 2 minutes or less from target declaration as TCT to presentation of COA options to the operator. System must process a minimum of 25 TCTs at the same time.
> **Objective:** 1 minute from target declaration as TCT to presentation of COA options to the operator. System must process a minimum of 100 TCTs at the same time.

4.1.6.1 Automated Course of Action (COA) Options Assistance.

System must display availability of weapons systems, both immediately available and those forecast in the ATO for a operator defined time parameter that may be employed against a TCT. Must calculate and display a recommended prioritization of COAs based on user-defined parameters. Must display on screen as defined by user the weapon or system type (F-15E, B-1, ATACMS, Tomahawk, HH-60G, etc.) and include amplifying data; e.g., entity Call Sign, # platforms (single, 2 or 4-ship), weapons and fuel, mission priority, strike package integrity, etc. (T=O)

4.1.6.2 Weapon-target pairing tool must calculate the following outputs (T=O):

- Time-on-target (TOT) predictions
- Probability of Kill (Pk)
- Probability of Survivability (Ps) of the weapon system
-Recognize existing Airspace Control Measures (ACMs) impacting COAs
- Identify ACMs that need to be implemented in order to complete the attack on the designated TCT

4.1.6.3 Automated Tasking Assistance.

Create automated tasking messages (9-line format for voice, TADIL J J12 series for datalink) to enable operator tasking to weapon(s) assets with basic target and attack support information. Via TBMCS/GCCS interface, distribute tasking message plus collateral track management and asset status messages. WTP must be sufficiently responsive to allow 15 to 30 seconds for operator review of COAs and selection of preferred alternative then disseminate tasking messages within:

> **Threshold:** 1 minute from presentation of prioritized COAs as described in para 4.1.6.

> **Objective:** 30 seconds from presentation of prioritized COAs as described in para 4.1.6.

4.1.6.4 Weapon-to-Target pairing data must be integrated real time into the single integrated air picture (SIAP) and resulting Common Operational Picture (COP) for situational awareness. (T=O)

4.1.6.5 System and user must have electronic access to data on current disposition of enemy orders of battle and installations and real- to near-real time notification of status change to TCT for such targets. Furthermore must have electronic access to friendly data such as COP plus ATO, and ACM for asset weapons and fuel status, assigned mission state, etc..(T=O)

4.1.6.6 Additional RTIC Support

Coincident with provisions of para 4.1.6.1 through 4.1.6.5, WTP must interface with ISR Battle Management software to capture data on the feasibility of direct sensor support to assets in weapons COA development. Use ATO and CMP databases to provide callsigns, frequencies, controlling agency, etc. in voice communication; channel numbers or codes for communication of sensor data to shooter; net participation group designators for datalink connectivity.

> **Threshold:** Collect and present RTIC support data to C2 operator for evaluation and transmission to appropriate tasked shooter.
> **Objective:** Expand upon Threshold requirement to include automated message formatting and transmission to shooter and sensor controller.

4.1.7 <mark>Launch and Impact Point ; Nuclear, Biological, and Chemical (NBC) Dispersion Prediction Tool (LIP/DP)</mark>

Correlate (T) / Fuse (O) data for accurate TM launch point and impact point predictions from either single or multiple reports. Provide automated NBC contamination dispersion predictions for release of agents at altitude from successfully intercepted missiles to detonation of warheads at or near the surface. Generate warning reports and provide interface via TBMCS/GCCS to theater warning dissemination POCs.

> **Threshold:** correlate multiple launch(es) reports to single track report per missile in [NRT] within [TBD] accuracy error ellipse for operator action in active defense cueing and passive defense warning.
> **Objective**: fuse multiple launch(es) reports to single track report per missile in [NRT-] within [TBD-] accuracy error ellipse for automated active defense cueing and passive defense warning.

4.1.8 <mark>Joint Target Collaboration and Execution Tool (JTCE)</mark> [KPP*]

Facilitate rapid joint and coalition collaboration between component commanders or their delegated battle managers for target development plus joint collaboration, coordination, and deconfliction of best course of action option (weapon assignment) among the combined assets available against TCTs.

> **Threshold:** Semi-automated visualization and communication (data and voice) between component C2 nodes to determine TCT status of target, show supported commander other component ISR and weapons options, disseminate supported commander's choice of available options.

Objective: Automated visualization and voiceless communication (voice as backup) between component C2 nodes to determine TCT status of target, show supported commander optimization of own and other component ISR and weapons options to include deconfliction, disseminate supported commander's choice of available options.

4.2   Information Exchange Requirements

TCT Functionality will derive most of its information via TBMCS LAN interface to database and communication support as well as the theater WAN for joint and coalition connectivity worldwide. See Table B at the end of this document for the IER Matrix.

4.3   Logistics and Readiness

The system as a whole shall be capable of providing continuous support to TCT prosecution for extended periods of time ranging from short-term support in contingency operations to long-term, in-garrison C2 node operations. The goal is to have the system operating 24 hours a day, 7 days a week.

4.3.1.1   Critical component Availability Objective is 99% although multiple TCT workstations will be expected to provide continuous availability of TCT Functionality. (T=O)

4.3.1.2   In the event of system failure, the system must be able to save and clear the data stored in memory.

> **Threshold:** Not more than 10 percent of previously unsaved data may be lost due to such an occurrence. No previously saved data may be lost.
> **Objective:** No data may be lost due to such an occurrence. Power outage will be prevented through use of uninterrupted power supply.

4.3.1.3   TCT Functionality will be supported by a 24/7 Tier 1 and Tier 2 Help Desk consistent with the host C2 node TBMCS system. Help Desk will respond to questions from the field and install updated operational software versions. Detailed software support questions will be referred to the software developer (Tier 2) for corrective action. "Remedy©" Action Request System (ARS) will be used to record and transmit "trouble tickets."

4.4   Other System Characteristics

Note: Section 4.4 subsections contain Threshold requirements

4.4.1   Electronic Attack and War Reserve Modes

No special provision is to be made for TCT enhancements. Interface to TBMCS databases and services should provide sufficient consideration for these issues.

4.4.2   Operating Environment. TCT Functionality will match TBMCS; that is, any theater anywhere in the world under the same conditions (T=O). Specific requirements will be available in the TBMCS SVRD. Expanded discussion of TBMCS-related requirements follow:

4.4.2.1   Electromagnetic Interference (EMI). TCT will not have any capabilities to operate in EMI environments. The system will be designed to provide equipment protection from power surges and drops.

4.4.2.2   Environmental Conditions. The TCT electronic equipment will be operated in field conditions ranging from tents to fixed facilities. In transit, appropriate shipping cases, containers, and/or tactical shelters will protect the equipment. Protection will be provided against the following conditions:

Climate Extremes - hot and dry deserts; hot, humid, rainy tropics; cold polar environments. Weather factors include blowing sand and dust, ice, snow, heavy rainfall, lightning, extreme temperatures, and humidity from -40 to +50 degrees Centigrade.

Sand and Dust - equipment shall be protected enough (i.e., by filtering and protective casing) to operate with dust and sand for up to 30 minutes of a sandstorm at 60 mph.

Salt Spray and Fog - equipment shall be able to be transported in salt spray and fog. The equipment shall be capable of withstanding corrosion in a high humidity environment.

4.4.3   Safety. Design and development of both hardware and software systems and support equipment should include the latest safety, fire, and health technology and comply with the Occupational Safety and Health Act (OSHA) and Air Force Occupational Safety and Health (AFOSH) standards to match TBMCS.

4.4.3.1 System Safety. TCT Functionality shall be fully integrated into the TBMCS safety plan.

4.4.3.2 Industrial/Occupational Safety. Human factors and safe engineering design concepts will be utilized. Weight, lifting, set-up/tear-down and operational ergonomics must be included in the design considerations of the system.

4.4.3.3 Energy Management. The system is required to operate on standard, nominal commercial power (110-120/208/240 VAC, 60 Hz; 240 VAC, 50 Hz, or 230 VAC, 50/60 Hz) with power conditioning and continuation equipment such as uninterruptible power supply (UPS).

4.4.4   Survivability.

4.4.4.1 System Survivability. Modular system operation is required to provide both hardware and software survivability/redundancy and operational flexibility

4.4.4.2 Data survivability through such means as data redundancy, data distribution, and data replication.

4.4.4.3 System operation cannot rely on multiple dedicated communication lines.

All information must be capable of being input into the system via any one and/or all of the currently used modes of tactical and fixed communications systems. TCTA-E workstations will provide an embedded communications interface, and a man-machine interface to communications, data, and processing support functions within TBMCS/GCCS and discrete communication capability as may be required outside TBMCS capabilities.

4.4.4.4 Personnel must be able to use the system while in nuclear, biological, and chemical (NBC) protective equipment.

4.4.5 Security.

4.4.5.1 Physical Security, Protection of Classified Information, Computer Security (COMPUSEC), and Communications Security (COMSEC) for TCT Functionality must follow DoD and Air Force instruction requirements for the TBMCS network to which it will connect. TCT Functionality must not degrade TBMCS host system. TCT shall be capable of inputting, outputting, storing and processing classified information at the Secret, Collateral level. (T=O)

4.4.5.2   TEMPEST. GOTS/COTS system equipment will meet TEMPEST evaluation criteria. Physical protection and separation will be maintained until TEMPEST certification is achieved.

4.4.6 Software Engineering.

System development must conform to open system standards to facilitate the integration and interoperability with other component-level systems, and utilize the TBMCS Style Guide and should be compliant with the DoDIIS reference model for interfaces between TBMCS and CIS/GCCS-I3. This program will use rapid prototyping for initial development and transition to an evolutionary acquisition approach for the life cycle of the system.

5. Program Support

This TCT ORD designation is a (joint, joint interest or independent) program. TCT Functionality enhances the JFACC C2 capability of the joint/coalition TACS for the command of aerospace power against TCTs. Furthermore, TCT Functionality enables more effective collaboration with other component commanders in support of overall JFC objectives for domination of the battlespace against TCTs.

5.1   Maintenance Planning

The TCT Functionality will follow the general maintenance planning of the host C2 system, TBMCS. As such, TCT systems are expected to follow the two-level maintenance concept of organizational and depot to support the system. Organic users will perform Organizational or "first look". A contractor logistics support (CLS) service will provide remove and replace, repair and shipping for all COTS equipment. The contractor will ensure that the Availability Objective is maintained at all times. The contractor will provide trained personnel and enough on-hand spares to meet mission availability. The contractor will deploy with the equipment during contingency and training events. A deployment spares package will be designed to support a 30-day contingency or deployment. The contractor must be able to obtain at least a Secret level security clearance.

Alternatively, the fielded system primary planning approach for depot repair would be contractor support until the Source of Repair Assignment Process (SORAP) data is collected and evaluated and the contract versus organic repair source decision has been determined. Selected equipment will be identified for "technical refreshment" that will keep it updated with current technology. Plan to take advantage of warranty periods to reduce overall maintenance costs for those items

5.2   Support Equipment

The system will make maximum use of standard tools. No exclusive support equipment shall be required or developed.

5.3   C4I Standardization, Interoperability, and Commonality

The system shall operate in the environment of the joint community and among coalition partners using established data and message formats. Operations workstations must be able to readily monitor and communicate via all internal and external communications interfaces within the host C2 node's existing capabilities.

5.3.1   The system will be compatible with TBMCS in the Air Force, with a migration path to GCCS.

5.3.2   Backward compatibility must be maintained or other measure accommodated within TCT hardware and/or software interface design to ensure interoperability between other services and coalition partners.

5.4   Computer Resources

5.4.1   Computer Constraints. The system must make maximum use of existing hardware when feasible and within reduced deployment footprint considerations. Language requirements must support read write from to TBMCS services, applications, and databases without loss of data in translation..

5.4.2   Database Constraints. TCT Functionality is expected to draw database support primarily from Air Operations and Modernized Integrated Databases supporting TBMCS; however, a near-real time database segment of TCT specific IPB, Guidance, ROE, and other data may be required for timely access in support of TCT Functionality.

5.4.3   Architecture Constraints.

5.4.3.1   Toolset must comply with all applicable information technology standards in the DoD Joint Technical Architecture (JTA), and the Defense Information Infrastructure Common Operating Environment (DII-COE). Consideration may be given for initial accommodation of existing TBMCS waivers; however, TCT Functionality must show clear migration path to full compliance with standards in GCCS. (T=0)

5.4.3.2   Standards for DII-COE compliance.
Threshold: Level 5 at IOC; Level 6 at FOC

Objective: Level 7 at IOC; Level 8 at FOC

5.4.4   Interoperability Constraints. The system will be interoperable with legacy systems through TBMCS prior to all services eventual migration to GCCS.

5.4.5   User Interface Requirements.

5.4.5.1 Joint standard terminology and symbology will be used in TCT Functionality.

5.4.5.2   Documentation

5.4.5.2.1   GOTS: existing technical order standards, procedures and support infrastructure rules apply.

5.4.5.2.2   COTS: commercial manuals will be used as is. No verification or supplementation will be accomplished. The government cannot change existing commercial manuals. Software User Manuals (SUM) will be verified prior to testing, training and deployment.

5.4.5.2.3   If developmental equipment is incorporated within TCT Functionality during evolutionary acquisition, then a fully complete tech manual quality assurance will be instituted IAW T.O. 00-5-3.

5.5   Human Systems Integration

5.5.1   Manpower has been estimated at a maximum of 3 officer and 9 enlisted per AOC beddown or 3 officer and 6 enlisted per cell for subordinate node such as a BCC. Integration of TCT Functionality within established duty positions and TTP at the C2 node may modify those numbers.

5.5.2   Human Computer Interface (HCI) shall be of a design that is consistent with industry and DII-COE standards and DoD Joint Technical Architecture (JTA) standards and guidelines, the objective being to take full advantage of operators' prior experience with computer interfaces.

5.5.3   Training.

5.5.3.1   Initial fielding (i.e. system deployment) training will be conducted on-site by mobile training teams as specified in the System Training Plan (STP) to be developed for the resulting TCT Functionality components.

5.5.3.2   Training materials are required for use by any unit's organic training functions to support training for individuals who rotate into the unit after a mobile training team has visited. Training materials should reside on the software as well as in a training document format that can be printed out for the student. Should have leave-behind lesson plans that are updated as the system evolves and is updated.

5.5.3.3 System training will be incorporated into the services' occupational specialty producing courses. Additional training will be provided in appropriate professional and executive development courses. Earliest possible identification of positional duties and task breakout must be accomplished in evolutionary development in order to align training requirements to appropriate occupational specialties.

5.5.3.4 Unit and individual proficiency training will utilize actual system capabilities to accomplish training objectives.

5.5.3.5 Computer based training (CBT) methodology and techniques will be the preferred means of accomplishing training objectives at all levels.

5.5.4 Human Factors.

Components must be designed to consider all personnel required to operate and maintain the system. These interfaces shall consider but not be limited to: life support, human characteristics, biomedical factors, workload reduction, cognitive capabilities and limitations, job facilitation, performance aiding control and display integration, etc.

5.5.5 Environment, Safety, and Health.

5.5.6 "Environment, Safety, and Health, design, cost, and risk drivers are important to the user community. Operations, Maintenance, Support and Disposal activities require a system with minimal hazardous material (HAZMATs); minimal health risks; minimal safety risks; and minimal environmental life cycle costs. Any HAZMATs used as part of the system's Operations, Maintenance, Support and Disposal activities, must be identified and adequate procedures and equipment (to include engineering controls/appropriate personal protective equipment or administrative controls) must be included with the delivered system to minimize environmental, personnel safety and health risks. The System and its support will not present uncontrolled safety, health or environmental hazards throughout its life cycle. Any safety/health hazard will be controlled throughout the life cycle."

5.6 Other Logistics and Facilities Considerations

5.6.1.1 Facilities; no new facilities will be required. TCT Functionality will integrate into the receiving C2 node protective and support requirement.

5.6.1.2 Packaging, Handling and Transportation; no special measures required. TCT Functionality components will follow commercial practices in this area.

5.6.1.3 Power: IAW the requirements of the host C2 node for support to TBMCS. TCT Functionality will not require special consideration for power conditioning beyond uninterrupted supply provision.

5.7 Transportation and Basing

Equipment and manpower package for TCT Functionality will be integrated into the UTC for the assigned unit. As such, equipment must meet all standards for deployability attendant to those TACS systems.

5.7.1 The system shall be modular, capable of being operated while mounted in ground, sea or aircraft platforms (whether integrated into the host systems or operating in as an adjunct) or while dismounted in buildings, tents, or other shelters.

The system will allow packing in standard shipping containers (transit cases) that may be palletized or carried separately in vehicles. The containers and their associated lifting and tie-down provisions must meet US and NATO standards.

5.8 Geospatial Information and Services

The equipment and applications comprising TCT Functionality will use National Imagery and Mapping Agency (NIMA), and Digital Topographic Data (DTD) joint service mapping standards to ensure interoperability with other systems. Geographic mapping and gridding functions will be based on Universal Transverse Mercator (UTM) and latitude/longitude coordinates referred to by the World Geodetic System (WGS-84), be compatible with existing and future Global Positioning Systems (GPS) receivers.

5.8.1 Analytical tools needed to defeat time critical targets require access to a wide variety of GI&S products. The tools shall use primarily NIMA standard digital products (e.g. raster maps, vector maps - imagery, terrain, and vegetation overlays - elevation data) obtained via TBMCS databases and web services.

5.8.2 The system shall also be capable of using non-standard digital products (e.g. AFCENT low flight charts, NATO maps). Other sources of digital data may include USGS data (US only), satellite images (e.g. LANDSAT, SPOT, MSI, HSI) to determine land use/land cover. Some examples of commonly used data are:

- CADRG (Compressed Arc Digitized Raster Graphics)
- NITF (National Imagery Transmission Format)
- CIB (Controlled Image Base)
- Vertical Obstruction Data
- DTED/DFAD (Digital Feature Analysis Data)
- Level 1: 3 arc second (92 meter) resolution
- Level 2: 1 arc second (30 meter) resolution
- Level 3 – 5 if available
- DAFIF (Digital Aeronautical Flight Information File)
- DPPDB (Digital Point Positioning Database)
- DTOP (Digital Topographic Data)
- ITD (Interim Terrain Data)
- TTD (Tactical Terrain Data)
- FFD (Foundation Feature Data)
- VOD (Vertical Obstruction Data)
- VPF (Vector Product Format)

- WVS (World Vector Shoreline)/WVS Plus

5.9   Natural Environmental Support

TCT Functionality requires the standard and unique base level weather projections and climatology data for Theater areas of concern.

> **Threshold:** The system shall be capable of readily importing and using all DOD standard weather, oceanographic, and astrogeophysical data.
> **Objective:** The system should be capable of readily importing and using commercially provided weather, oceanographic, and astrogeophysical data.

6. Force Structure

TCT Functionality specifically facilitates dynamic C2 of theater forces during planned execution to meet the challenge of TCT and TST timing constraints. The actual final force structure is therefore pending results of in progress TACS reengineering study and baseline evaluation by AC2ISRC/C2C, C2TIG, and ACC/XOY.

> **Threshold:** Notional minimum force structure requirement is five sets of TCT workstations, interface equipment, and software tools for key AOCs. (T = 5)
> **Objective:** Notional maximum will consist of thirteen: eight (8) AOC-suitable sets (Seven (7) for incorporation into existing C2 nodes plus One (1) doubling as Field Training (FTU) and Test Unit at C2TIG; five (5) BCC or AETACS-equivalent sets for subordinate C2 node support to the TCT Functionality.

7. Schedule

The system will be developed and fielded on a planned two-year development and integration cycle. The cycle will entail maturing of software applications functionality into common baseline, jointly interoperable workstations for fielding at combined Air Operations Centers. IOC will be achieved with the delivery of the first deployable TCT Functionality prototype meeting at least threshold requirements identified in the Requirements Correlation Matrix (RCM). Deployable is defined as one set of TCT equipment (workstations, servers, cabling, plus ADSI and MUST radio as required) with integrated software applications, support material and unit level training delivered to C2TIG or Dynamic Battle Control Center at Nellis AFB and ready for worldwide re-deployment. Prototype IOC should be met by end-FY01, or other date agreed to by Air Combat Command (ACC) and the integrated product development team. First production system IOC will be 4Qtr FY03. FOC [TBD] as recommended by operations and intelligence representatives (A3 and A2) of the theater air component commands.

8. Program Affordability

A requirement exists for a low cost enhancement to the TBMCS system for real time TCT prosecution. The average unit procurement price for the system enhancement is no more than Threshold $8.0 million with an Objective of no more that $6.0 million (in FY00 dollars, for 13 units). Program costs must remain below ACAT III ceilings of no more than $30.0 million per year and $120.0 million total. For similar reason, life cycle costs must not exceed $360.0 million. The following high cost of ownership drivers were identified as potential areas where savings can be realized: 1) Operations and Maintenance training, 2) GOTS/COTS software updates, and 3) Support in contingency locations.

Appendix A: References

CJCSI 3170.01A, *Requirements Generation System*, 10 August 1999

CJCSM 3500.04B, *Universal Joint Task List, Version 4.0*, 1 October 1999

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Appendix B: Distribution List

HQ USAF/XORD	1	HQ AETC/XPRO	1
1480 Air Force Pentagon		244 F Street, Ste 2	
Washington, DC 20330-1480		Randolph AFB, TX 78150-4321	
reqmnts@af.pentagon.mil		hopkinsj@rndgate1.aetc.af.mil	

HQ AFMC/DRIX	1	HQ AFOTEC/XR	1
4375 Childlaw Street, Ste 6		8500Gibson Boulevard. S. E.	
WPAFB, OH 45433-5006		Kirtland AFB, NM 8711-5558	
		underwom@afotec.af.mil	

HQ ASCC/XRM	1	HQ USAFE/DOQ	1
204 Dodd Boulevard, Ste 226		Unit 3050 Box 15	
Langley AFB, VA 23665-2777		APO AE 06094-5015	

HQ PACAF/DOQ	1	HQ AFSPC/DRR	1
25 E Street, Ste I232		150 Vandenberg Street, Ste 1105	
Hickam AFB, HI 96853-5462		Peterson AFB, CO 80914-4660	
		afspc/drr@spacecom.af.mil	

HQ AMC/XPR	1	HQ AFDC/DO/DR	1
402 Scott Drive, Unit 3L3		155 Twining Street	
Scott AFB, IL 62225-5307		Maxwell AFB, AL 36112-6112	
		issues@hqafdc.maxwell.af.mil	

ASC/XRS	1	NAIC/POC	1
2100 3rd Street, Ste 2		4115 Hebble Creek Road, Ste 23	
WPAFB, OH 45433-7016		WPAFB, OH 45433-5627	

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Randolph AFB, TX 78150-4740

Rome Laboratories 1

AFRL/CD

26 Electronic Parkway

Rome, NY 13441-4514

weedenv@rl.af.mil

Appendix C: List of ORD Supporting Analyses

USAF Theater Missile Defense Mission Need Statement, Oct 91.

Joint Theater Missile Defense Mission Need Statement, Nov 91.

Theater Air Defense Vision, ACC/DRA, Nov 95

Combat Air Forces Concept of Operations for Command and Control Against Time Critical Targets, Jul 97 (a.k.a. *TCT CONOPS*)

Attack Operations Against Critical Mobile Targets, Interim Report on USACOM Experiment JE 9901, September 1999.

Joint Mission Area Assessment for Theater Air and Missile Defense - JTAMDO, 1999

Joint Theater Air and Missile Defense Master Plan - (S) JTAMDO, 1999

Appendix D: DT TCT RD-to-TCT ORD KPP/requirements crosswalk/linkage

DT TCT CRD KPP	Supporting TCT ORD KPPs
Interoperability: IAW the JTA, …the ability to conduct collaborative planning, battle management, weapons coordination, engagement and timely BDA to support TCT operations at the Joint and Theater Levels. (T=O)	**Interoperability** **TCTA-Enhanced Workstation** **Automated TCT IPB** **Weapon-to-Target Pairing** **Joint Target Collaboration and Execution**
Continuous [Intel Prep of the Battlespace] IPB/Collection management: …establish and maintain databases that can read and be read by other Service, Coalition, Allied databases in order to be able to extract pertinent data on possible TCTs within 2 Minutes (T) and 1 Minute (O) of a database query request.	**Automated TCT IPB**
Sensor Surveillance, Detection and Tracking of Mobile Ground Targets: After robust IPB, … need the ability to find 75% of the designated TCTs within multiple areas of interest contained within a 130,000 square nautical mile AOR within 5 minutes of tasking (T). (Includes retasking for post strike assessment.) …an appropriate mix of sensor systems to provide near real time (NRT) surveillance, detection, and tracking of surface TCTs. Detection of ground targets meeting TCT criteria must be disseminated in NRT (T) and RT (O) to execution level C2 nodes and battle managers	**TCTA-Enhanced Workstation**
Combat/Target Identification (CID): …establish and maintain a single, common combat identification on surface objects of interest within a surveillance area. (Threshold) (*Declaration rate*) Friend / Foe / Neutral $\geq$85% Class ID $\geq$ 75-80% (e.g. tank, fighter, bomber, SAM TEL Type ID > 70% (e.g. MIG-23, F-15C, T-72, UH-60) Nationality $\geq$ 50% (e.g. Polish MIG-23K) Intent $\geq$ 40% (amplification of information on what target is doing) (*Timeliness*) For ISR systems that are capable of deriving target identities from organic (0n-board/ground station, owned or controlled) sensors, an identity should take no more than 120 seconds for detection, validation, and verification. (Threshold) (Objective: 30 seconds) For shooters, CID processing must not extend engagement timelines (T=O) (*Confidence*) After declaration, CID systems must offer a 95% or greater probability of correct ID (Threshold); 99%	**TCTA-Enhanced Workstation**

or greater (Objective) Note: JFCOM CID CRD is in draft and will supercede and have precedence over this KPP when approved. This KPP does not address CID procedural ROE. Establishment of procedural requirements can further confirm/validate CID information during operations.	
Shared Information and Wide Area Communication Connectivity: …possess a common interface between /among theater systems that include as a minimum, …common data sets, and a common implementation of the COE (T) and will coordinate a migration to full compliance and common implementation of the Joint Technical Architecture.(O).	**TCTA-Enhanced Workstation** **Automated TCT IPB** **Joint Target Collaboration and Execution**
Decision Aids Support: …rapidly prompt battle managers with prioritized, realistic options within 2 minutes (T) or 1 minute (O) by accessing information within the Air Operations Data Base (AODB), Modernized Integrated Data Base (MIDB) or other information sources whether resident in a C2 node, attack platform, or airborne asset.	**Weapon-to-Target Pairing**
Tasking Timeliness Streamlined Process against TCTs: …put weapons on [TCT] target within 30 minutes of original detection (T) (15 minutes = O) to afford a measure of success. In order to meet this tasking timeliness, battle managers must select [choose specific weapons/platforms] and task [commit weapons to attack] assets within 3 minutes (T) [2 minutes (O)] of notice of a target meeting TCT criteria. [*TCT criteria will be established by the JFC*]	**Interoperability** **TCTA-Enhanced Workstation** **Automated TCT IPB** **Weapon-to-Target Pairing** **Joint Target Collaboration and Execution**
Target Engagement Negation: Multi-service weapons systems…shall have the capacity to collectively engage mobile ground targets selectively, sequentially, or simultaneously to provide the greatest likelihood of success. The TCT probability of negation for attacks must be 90% or greater (T=0). Weapons or weapon employment systems must be able to strike targets rapidly and if necessary, retarget/restrike within tasking timelines. Weapons employment is included in the 30-minute execution window outlined in the Tasking Timelines KPP. (Assumes precision engagement and CID are possible in 2010). Weapons must be able to engage (strike) TCTs anywhere in a theater within ten (10) minutes of identification and tasking. (O).	**Weapon-to-Target Pairing** **Joint Target Collaboration and Execution**

Glossary:

Part I: Abbreviations and Acronyms

A2IPB	Automated Association of Intelligence Preparation of the Battlespace
ACAT	Acquisition Category
ACTD	Advanced Concept Technology Demonstration
ADSI	Air Defense Systems Integrator
AETACS	Airborne Elements of the Theater Air Control System
AFCENT	Air Forces Central Europe
AFI	Air Force Instruction
AFOSH	Air Force Occupational Safety and Health
AIS	Automated Information System
ALTA	Area Limitation and Terrain Analysis
AOA	Analysis of Alternatives
AODB	Air Operations Database
AOR	Area of Responsibility
APB	Acquisition Program Baseline
ARS	Action Request System
ASAS	All Source Analysis System
ATDL	Army Tactical Data Link
ATIPB	Automated TCT Intelligence Preparation of the Battlespace
ATO	Air Tasking Order
AWACS	Airborne Warning and Control System (E-3)
BCC	Battle Control Center (proposed evolution of CRC battle management)
BDA	Bomb Damage Assessment
CADRG	Compressed Arc Digitized Raster Graphics
CBT	Computer based training
CC	Commander
C2	Command and Control
C2TIG	Command and Control Training and Innovation Group
C4ISP	Command, Control, Communications, Computers, and Intelligence Support Plan
C4ISR	Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance
CFITS	Center For Information Technology Standards
CIB	Controlled Image Base
CID	Combat Identification
CINC	Commander-in-Chief
CJCS	Chairman of the Joint Chiefs of Staff
CJCSI	Chairman of the Joint Chiefs of Staff Instruction
CJCSM	Chairman of the Joint Chiefs of Staff Memorandum
CLS	Contractor Logistic Support
COD	Combat Operations Division (at the AOC)
COE	Common Operating Environment
COMPUSEC	Computer Security
COMSEC	Communications Security

CONOPS	Concept of Operation
COP	Common Operational Picture
COTS	Commercial Off-the-Shelf
CMP	Collection Management Plan
CRC	Control and Reporting Center
CRD	Capstone Requirements Document
CTAPS	Contingency Theater Air Planning System
CTP	Common Tactical Picture
DAFIF	Digital Aeronautical Flight Information File
DBCC	Dynamic Battle Contol Center
DFAD	Digital Feature Analysis Data
DIA	Defense Intelligence Agency
DII	Defense Information Infrastructure
DoD	Department of Defense
DoDD	Department of Defense Directive
DoDIIS	DoD Intelligence Information System
DPPDB	Digital Point Positioning Database
DT&E	Development Testing and Evaluation
DTD	Digital Topographic Data
DTED	Digital Terrain Elevation Data
DTOP	Digital Topographic Data
EA	Electronic Attack
EAF	Expeditionary Air Force
ECM	Electronic Countermeasures
ELINT	Electronic Intelligence
EMC	Electromagnetic Compatibility
EMP	Electro Magnetic Pulse
ESM	Electronic Support Measures
EW	Electronic Warfare
FFD	Foundation Feature Data
FOC	Full Operational Capability
FoS	Family of Systems
FTU	Field Training Unit
FY	Fiscal Year
GCCS	Global Command and Control System
GCCS-AF	GCCS-Air Force
GCCS-I3	GCCS-Integrated Intelligence and Imagery
GI3	GCCS-Integrated Intelligence and Imagery
GI & S	Geospatial Information & Services
GOTS	Government Off-the-Shelf
GPS	Global Positioning System
GUI	Graphic User Interface
HAZMAT	Hazardous Material
HCI	Human Computer Interface
HITL	Human in the Loop
HSI	Human-System Interface

HUMINT	Human Intelligence
IA	Information Assurance
IAW	in accordance with
ICD	Interface Control Document
ID	Identification
IER	Information Exchange Requirement
IOC	Initial Operational Capability
IPB	Intelligence Preparation of the Battlespace
IMINT	Imagery Intelligence
ISR	Intelligence, Surveillance, Reconnaissance
IT	Information Technology
ITD	Interim Terrain Data
JAOC	Joint Air Operations Center
JE	Joint Experiment (USJFCOM)
JFACC	Joint Force Air Component Commander
JFC	Joint Force Commander
JITC	Joint Interoperability Test Command
JOA	Joint Operations Area
JPD	Joint Potential Designator
JROC	Joint Requirements Oversight Council
JROCM	JROC Memorandum
JSTARS or JtSTARS	Joint Surveillance Target Attack Radar System (E-8)
JTA	Joint Technical Architecture
KPP	Key Performance Parameter
LOC	Line of Communication
MAA	Mission Area Analysis
MASINT	Measurement and Signature Intelligence
MIDB	Modernized Integrated Database
MNS	Mission Need Statement
MOE	Measure of Effectiveness
MSI	Multi-Spectral Imagery
MTI	Moving Target Indicator
MTTP	Multi-service Tactics, Techniques, and Procedures
NATO	North Atlantic Treaty Organization
NBC	Nuclear, Biological, and Chemical
NCA	National Command Authority
NIMA	National Imagery and Mapping Agency
NITF	National Imagery Transmission Format
NRT	Near-real Time
NSA	National Security Agency
O	Objective
OASD (C3I)	Office of the Assistant Secretary of Defense (Command, Control, Communications and Intelligence)
OPCON	Operational Control
ORD	Operational Requirements Document
OSHA	Occupational Safety and Health Act

OT	Operational Testing
OT&E	Operational Test and Evaluation
PER	Prioritized Exploitation Requirement
PIR	Priority Intelligence Requirement
PM	Program Manager
PPS	Precise Positioning Service
POC	Point of Contact
RCM	Requirements Correlation Matrix
R&D	Research and Development
RDT&E	Research, Development, Test, and Evaluation
ROE	Rules of Engagement
RT	Real Time
S	Secret
SAM	Surface-to-Air Missile
SAMP	System Acquisition Master Plan
SCDL	Surveillance Control Data Link
SCI	Sensitive Compartmentalized Information
SEAD	Supression of Enemy Air Defenses
SIAP	Single Integrated Air Picture
SIGINT	Signals Intelligence
SOF	Special Operations Forces
SOLE	Special Operations Liaison Element
SOM	Space-Oblique Mercator
SORAP	Source of Repair Assignment Process
SoS	System of Systems
STP	System Tracking Program or System Training Plan
STT	Strategy-to-Task
SWIFT	Software Integration Facility for Time Critical Targeting
T	Threshold
TACON	Tactical Control
TACS	Theater Air Control System
TACDIL	Tactical Action Data Link
TAFIM	Technical Architecture Framework for Information Management
TAMD	Theater Air and Missile Defense
TBM	Theater Ballistic Missile (subset of TM)
TBMCS	Theater Battle Management Core Systems
TCT	Time Critical Target
TCTA-E	TCT Awareness-Enhanced
TDDS	Tactical Related Applications (TRAP) Data Dissemination System
TEL	Transporter-Erector-Launcher
TEMP	Test and Evaluation Master Plan
TM	Theater Missile
TS	Top Secret
TST	Time Sensitive Target
TIBS	Tactical Information Broadcast System
TTD	Tactical Terrain Data or Technical Task Directive

TTP	Tactics, Techniques, and Procedures
U	Unclassified
UAV	Unmanned Aerial Vehicle
USGS	U.S. Geological Survey
UJTL	Uniform Joint Task List - - CJCSM 3500.04B
US	United States
UTC	Unit Type Code
VOD	Vertical Obstruction Data
VPF	Vector Product Format
WGS-84	World Geological Survey-84
WMD	Weapon(s) of Mass Destruction
WTP	Weapon-Target Pairing
WVS	World Vector Shoreline
Wx	Weather
XML	Extensible Markup Language

Glossary:
Part II: Terms and Definitions

Acquisition Category (ACAT) - Categories established to facilitate decentralized decision making and execution, and compliance with statutorily imposed requirements. The categories determine the level of review, decision authority, and applicable procedures. DOD 5000.2-R, part 1, provides the specific definition for each acquisition category (ACAT I through III). CJCSI 3170.01A, *Requirements Generation System*, 10 August 1999

Architecture - The structure of components, their relationships, and the principles and guidelines governing their design and evolution over time. CJCSI 3170.01A, *Requirements Generation System*, 10 August 1999

Capstone Requirements Document (CRD) - A document that contains capabilities-based requirements that facilitates the development of individual ORDs by providing a common framework and operational concept to guide their development. It is an oversight tool for overarching requirements for a system-of-systems or family-of-systems. CJCSI 3170.01A, *Requirements Generation System*, 10 August 1999

Common Operational Picture - "The COP is the integrated capability to receive, correlate, and display a CTP, overlays/projections (i.e., Meteorological and Oceanographic (METOC), battleplans, force position projections.) Overlays and projections may include location of friendly, hostile, and neutral units, assets, and reference points. The COP may include information relevant to the tactical and strategic level of command. This includes but is not limited to, any geographically oriented planning data from JOPES, readiness data from SORTS, intelligence (including imagery overlays), reconnaissance data from the Global Reconnaissance Information System (GRIS), weather from METOC, predictions of nuclear, biological, and chemical (NBC) fallout, and Air Tasking Order (ATO) data." CJCSI 3151.01, *Global Command and Control System Common Operational Picture Reporting Requirements,* 10 June 1997

Common Tactical Picture (CTP) - " The CTP is derived from the Common Tactical Dataset and other sources and refers to the current depiction of the battlespace for a single operation within a CINC's AOR including current, anticipated, or projected, and planned disposition of hostile, neutral, and friendly forces as they pertain to US and multinational operations ranging from peacetime through crisis and war". The CTP includes for location, real time and non-real time sensor information, and amplifying information such as METOC, SORTS, and JOPES." The CTP receives its information from the components CCP's, the COP, national sources, and other producers of information that report directly to the JTF. CJCSI 3151.01, *Global Command and Control System Common Operational Picture Reporting Requirements* 10 June 1997

Electromagnetic Compatibility (EMC) - The ability of systems, equipment, and devices that utilize the electromagnetic spectrum to operate in their intended operational environments without suffering unacceptable degradation or causing unintentional degradation because of electromagnetic radiation response. It evolves the application of sound electromagnetic spectrum management; system, equipment, and device design configuration that ensures interference-free operation; and clear concepts and doctrines that maximize operational effectiveness. CJCSI 3170.01A, *Requirements Generation System*, 10 August 1999

Electromagnetic Environmental Effects (E3) - 3 is the impact of the electromagnetic environment upon the operational capability of military forces, equipment, systems, and platforms. It encompasses all electromagnetic disciplines, including electromagnetic compatibility/electromagnetic interference; electromagnetic vulnerability, electromagnetic pulse; electromagnetic protection; hazards of electromagnetic radiation to personnel, ordnance, and volatile materials; and natural phenomena effects, of lightning and p-static. CJCSI 3170.01A, *Requirements Generation System*, 10 August 1999

Family-of-Systems (FoS) - A set or arrangement of independent systems that can be arranged or interconnected in various ways to provide different capabilities. The mix of systems can be tailored to provide desired capabilities dependent on the situation. CJCSI 3170.01A, *Requirements Generation System*, 10 August 1999

Information Exchange Requirements - The requirement for information to be passed between and among forces, organizations, or administrative structures concerning ongoing activities. Information exchange requirements identify who exchanges what information with whom, as well as why the information is necessary and how that information will be used. The quality (i.e. frequency, timeliness, security) and quantity (i.e., volume, speed, and type of information such as data, voice, and video) are attributes of the information exchange included in the information exchange requirement. CJCSI 3170.01A, *Requirements Generation System*, 10 August 1999

Integration - The arrangement of systems in an architecture so that they function together in an efficient and logical way. CJCSI 3170.01A, *Requirements Generation System*, 10 August 1999

Interoperability - 1. The ability of systems, units, or forces to provide services to and accept services from other systems, units, or forces and to use the services so exchanged to enable them to operate effectively together. (DOD)
2. The condition achieved among communications-electronics systems or items of communications-electronics equipment when information or services can be exchanged directly and satisfactorily between them and/or their users. CJCSI 3170.01A, *Requirements Generation System*, 10 August 1999

Joint Interface - A C4I interface that passes or is used to pass information between systems and equipment operated by two or more CINCs, Services, or agencies (C/S/As). CJCSI 3170.01A, *Requirements Generation System*, 10 August 1999

Joint Technical Architecture - The DOD Joint Technical Architecture (JTA) ...defines the service areas, interfaces, and standards (JTA elements) applicable to all DOD systems, and its adoption is mandated for the management, development, and acquisition of new or improved systems throughout DOD. CJCSI 3170.01A, *Requirements Generation System*, 10 August 1999

Key Performance Parameters (KPPs) - Those capabilities or characteristics considered most essential for successful mission accomplishment. Failure to meet an ORD KPP threshold can be cause for the concept or system selection to be reevaluated or the program to be reassessed or terminated. Failure to meet a CRD KPP threshold can be cause for the family-of-systems or system-of-systems concept to be reassessed or the contributions of the individual systems to be reassessed. KPPs are validated by the JROC. ORD KPPs are included in the APB. CJCSI 3170.01A, *Requirements Generation System*, 10 August 1999

Middleware - "Any software that allows elements of applications to interact across networks, despite differences in underlying business definitions, communication protocols, systems architectures, operating systems, databases and other application services". *Middleware Report Cuts Through The Confusion In Fast Growing Marketplace,* David Young, Middleware Practice for TCA Consulting, undated

Milestones - Major decision points that separate the phases of an acquisition program. CJCSI 3170.01A, *Requirements Generation System*, 10 August 1999

Mission Need - A deficiency in current capabilities or an opportunity to provide new capabilities (or enhance existing capabilities) through the use of new technologies. They are expressed in broad operational terms by the DOD components. CJCSI 3170.01A, *Requirements Generation System*, 10 August 1999

Mission Need Statement (MNS) - A formatted non-system-specific statement containing operational capability needs and written in broad operational terms. It describes required operational capabilities and constraints to be studied during the Concept Exploration and Definition Phase. CJCSI 3170.01A, *Requirements Generation System*, 10 August 1999

Real Time (RT) – "Pertaining to the timeliness of data or information which has been delayed only by the time required for electronic communication. This implies that there are no noticeable delays. See also near real time." Jt Pub 1-02, *DOD Dictionary of Military and Associated Terms*

Near-real Time (NRT) – "Pertaining to the timeliness of data or information which has been delayed by the time required for electronic communication and automatic data processing. This implies that there are no significant delays." Jt Pub 1-02, *DOD Dictionary of Military and Associated Terms* (see also definition below)
            – "…within 5 seconds to 5 minutes of occurrence" OP 2.5.3, CJCSM 3500.04B *Universal Joint Task List* 1 October 1999 (see also definition above)

Operational Requirements Document (ORD) - A formatted statement-containing performance and related operational parameters for the proposed concept or system. Prepared by the user or user's representative at each milestone beginning with Milestone I. CJCSI 3170.01A, *Requirements Generation System*, 10 August 1999

Procedural Interface - The methods and procedures employed to establish an interconnection within and between systems and/or equipment and to transfer information within or between systems and/or equipment. CJCSI 3170.01A, *Requirements Generation System*, 10 August 1999

Requirement - The need of an operational user, initially expressed in broad operational capability terms in the format of a MNS. It progressively evolves to system-specific performance requirements in the ORD. CJCSI 3170.01A, *Requirements Generation System*, 10 August 1999

Technical Interface - The functional, electrical, and physical characteristics necessary to allow the exchange of information across an interface between different C4I systems and equipment. Includes Technical Interface Standards. CJCSI 3170.01A, *Requirements Generation System*, 10 August 1999

Table A: ORD KPP Summary

SYSTEM CAPABILITIES & CHARACTERISTICS	THRESHOLDS	OBJECTIVES
4. Capabilities Required	-	-
4.1 System Performance	-	-
4.1.1 Mission Scenarios	-	-
4.1.2 Specific Performance / KPP ID Interoperability: components of TCT Functionality must accommodate joint and coalition data and message standards for free exchange of information. TCT Functionality must interface with TBMCS/GCCS-AF to leverage services, databases, and wide area connectivity to joint component and possible coalition C2 systems.	T = Interface through TBMCS/GCCS-AF with joint components and coalition partners; employ common information. and communications standards.	O = Integrate TCT Functionality within GCCS-AF system capabilities.
4.1.3 TCT Awareness Enhanced Workstation Processing and Display (TCTA-E) **[KPP]** Improve functionality of TBMCS-compatible workstation to process, analyze, and display real-/near-real time MTI, SAR, video, and other all-source sensor and INT information with electronic map data for a common operational picture (COP) of aerospace and surface battlespace activity. Facilitate operator use of embedded and other web-based applications or products for joint situation awareness, target development and nomination as TCT, and employment actions against TCTs (using IPB products in finding TCTs, engaging a TCT with selected available weapons, assigning ISR assets; etc) ...all within the	**Threshold:** Situation display system supports *correlation* of multiple inputs to assist the operator with *2-D display* for object detection, evaluation and designation as TCT, decision support presentation to and option selection by command authority, asset tasking and target engagement timeline.	**Objective:** Situation display supports *fusion* capability for *3-D* display in above objectives.

Table A-1

available timeline to successfully engage or exploit TCTs. TCT Functionalitywill interface with TBMCS to draw information from, and contribute information to the TACS COP as well as to leverage other TBMCS databases, information services, and other applications. The system will use and integrate existing COTS/GOTS hardware and software applications, where appropriate, plus joint mandated applications (e.g., CTAPS, TBMCS and GCCS). The system will be able to establish, tailor, store and modify operator profiles and privileges.		
4.1.3.1 TCTA-E include or draw from tools within TBMCS to convert coordinates of items such as target and navigation points from one datum to another. Required accuracy, resolution, datums, and scales are specific to types of targets being analyzed.	T=O	
4.1.3.2 The system shall be capable of accepting future improvements or changes to NIMA products and databases.	T=O	
4.1.3.3 The system should be capable of using commercially provided geospatial data, e.g. data from commercial satellites (LANDSAT, SPOT). This data must be convertible between different map projections, e.g. Space-Oblique Mercator (SOM) to geographic (equal arc-second).	T=O	
4.1.3.4 System requires the capability to access, store and retrieve massive volumes of	**Threshold**: Access and retrieve data within 2 minutes.	**Objective**: Access and retrieve data within 1 minute.

Table A-2

data efficiently (emphasis on XML interface) including: web-based LAN and WAN access among all authorized users, storage, ability to synchronize information and the means to quickly search for specific information using intelligent agents to act on behalf of the user.		
4.1.3.5 System shall provide an automated means to integrate information that is provided in different modes, such as voice, text, and graphics.	**Threshold**: Direct data, voice, text, symbology	**Objective**: Include speech recognition
4.1.3.6 System shall support rapid Modeling and Simulation (M&S) capability (including C3I) and statistical analyses of enemy activity for Situation Assessment and both friendly and enemy COAs and capability to validate the planning alternatives with mission preview and rehearsal.	T = O	
4.1.3.7 Software implementation will be such that operator or maintenance personnel can start, restart, terminate, and control system operation including any data base initialization, system harmonization, and functional configuration from the workstation.	T = O	
4.1.3.8 System shall provide the capability to display non-destructive (transparent) overlays derived from multiple database or application sources in user definable stacks.	**Threshold**: Operator selectable and filterable 2-D overlays. Store user defined profiles to accelerate man-machine interface.	**Objective**: Operator selectable and filterable 3-D overlays. Store multiple user-defined profiles to accelerate man-machine interface
4.1.3.9 System shall provide the capability to alert users of new TCT information that is user defined and filterable (declutter) in terms of TCT	T = O	

Table A-3

activity and priority. The system shall rapidly display correlated (in time and space) all-source data and information.		
4.1.3.10 Display results from any sensor possessing automatic target recognition (ATR) capability integrated with other sources to enhance specific target identification (ID). Displayed data should contain all information related to characterization and ID of the TCT; confidence intervals on target characterization and ID should be displayed if sensor(s) or system(s) can compute this information. Tracks confirmed as a "hostile TCT" should be distinguishable on display from other tracks.		O
4.1.3.11 Provide the ability to quickly access TCT –related, sanitized multi-INT data being fulfilled by national assets to the AOC.	**Threshold**: Provide data within two minutes of identifying TCT related activities.	**Objective**: Provide data in RT.
4.1.3.12 TCTA-E will host or provide interface with the ISR Battle Management Tool (or other fielded collections management application) to aid the operator in visualizing Collections Management Plan coverages and coordinating with the Collections Manager for possible tasking and re-tasking of ISR assets to support time critical targeting.	T = O	
4.1.3.13 Provide interface to access JFC and Component CC intentions, guidance, and ROE for user review and use by TCT applications for use during TCT planning and execution processes.	T = O	
4.1.3.14 System shall accept,	T = O	

Table A-4

process, display and directly store or have access to RT/NRT inputs for current display and history playback (estimated maximum two weeks daa) from all sources including Tactical Related Applications (TRAP) Data Dissemination System (TDDS) broadcasts; Tactical Information Broadcast System (TIBS); Tactical Digital Information Links (TADIL) A, B, and J; Army Tactical Data Link (ATDL-1); Surveillance and Control Data Link (SCDL) or SCDL Echo; and Image Product Archive (IPA).		
4.1.3.15 User must be able to access and display target data (e.g. symbology, lat/long) with associated details.	**Threshold:** User has the ability from both text-based and map-based user interfaces to manually query database and pull for display the target type, classification, identification, and dwell time, and if applicable, heading, altitude and speed of target.	**Objective**: Provide automated query and an animated display of the moving target and its predicted path; include target type, classification, identification, dwell time, and if applicable, heading, altitude and speed of target.
4.1.3.16 System must provide interface to transmit / receive communications via datalink, voice, video, and text.	T = O	
4.1.4 Area Limitation and Terrain Analysis Tool (ALTA) TCT Functionality will facilitate analysis to identify possible TCT operating areas and usable LOCs including movement projection, observation refinement, terrain suitability, and terrain masking analysis. System shall project TCT locations based on initial location estimate, predict and provide a means to identify the most likely locations and		

Table A-5

deployment states of TCTs based on single or multiple observations, and consider various TCT parameters for on and off road vehicle movements. Consider a wide range of TCTs including but not limited to: Theater missiles (launch, hide, move, and reload areas); Mobile missile support sites; Armor (move, hide, rearm, refuel sites); Elements of fire support; Self-propelled artillery; Mobile air defense sites (SAMs).		
4.1.4.1 Products of the area limitation and terrain analysis must be timely and presented to the user in a standardized overlay format, preferably graphical, to support target development and execution applications, variety of strike platforms, and weapon systems.	**Threshold**: manually initiated new analysis of 100 x 100 Km area within 10 minutes; quick reaction 10 x 10 Km area "chip" of previous analysis within six (6) seconds, new analysis of same 10 x 10 Km area within 1 minute.	**Objective**: automated analysis as above initiated on target declared TCT, any point derived from reports associated with TCT parameters.
4.1.4.2 Provide the capability to manipulate Digital Terrain Elevation Data (DTED) and other standard NIMA geospatial products (e.g. Foundation Feature Data, Digital Topological Data, digital raster and vector data) at the workstation. Datum standard will be WGS 84. Provide the capability to load and manipulate standard NIMA, United States Geological Survey (USGS), Geospatial Information (GI) data (including but not limited to DTED, DFAD, ITD, FFD, MSDS, CADRG, DCW, CIB, LANDSAT, SPOT, etc.) and available commercial products.	**Threshold**: Accept and manipulate CADRG up to DTED Level 3.	**Objective**: Accept and manipulate all NIMA, USGS and GI up to DTED Level 5.
4.1.4.3 Provide the capability	T = O	

Table A-6

to display weather and climatologic data derived from standardized databases, and incorporate data into analyses and predictive capabilities.		
4.1.4.4 Provide the capability to identify and measure terrain line of sight analysis in full view from a known point to include environmental effects. System shall consider, but not be limited to, assessing the following effects on TCT operations: land class, soil, foliage conditions, concealment, terrain accessibility, including terrain slope, vehicle type, mobility by land class, the effect of weather and seasonal changes; effect of local traffic on mobility; Battle Damage Assessment; Lines of Communication (LOCs); ability of the terrain to support TCTs primary function (e.g. TMs within range of threat targets); ability of adjacent terrain to support TCT operations.	T = O	
4.1.4.5 Create detailed, scaled slope and elevation terrain profile line drawings and associate these with other vector and raster graphics or imagery files.	T = O	
4.1.4.6 Create comprehensive mobility analysis products based on standard DIA MEPED equipment characteristics for specific tracked and wheeled vehicles. Display overlays as a representative probability the TCT could be at that location. Include weather's effect on cross-country mobility.	**Threshold:** Three (3) percentile valuations (go, no go and difficult).	**Objective**: Ten (10) percentile values (0 – 100) with user-defined criteria for data display.
4.1.4.7 Create time projections	T = O	

Table A-7

of likely TCT movement along variably set distances with the ability to overlay technical capabilities with demonstrated or hypothetical doctrine and TTP templates. Display results graphically .		
4.1.5 Automated TCT IPB Tool (ATIPB) [KPP] Support ability of operators to collate, process, publish, and access for "playback" IPB products; that is, use with the COP on TCTA-E, multiple digital IPB products to find, identify, and fix TCTs, both current location and probable future location for engagement. Operators use ATIPB to determine Named Areas of Interest (NAIs) and Targeted Areas of Interest (TAIs), target Nomination Indices, and threat Courses of Action (COA). This supports the operator with preplanned and dynamic retasking of joint ISR collections against TCT target elements, for reconnaissance of personnel recovery escape and evasion areas, and to estimate enemy timetable and intent. Operators further use ATIPB products in playback mode interfacing with R/NRT sensor feeds in the COP and the JFACC Guidance and ROE. Enemy movements or specific intel reports related to NAI and TAI should trigger operator alerts for closer scrutiny and decision for further action; application should provide for evidence accumulation to operator defined threshold of target nomination as TCT.		
4.1.5.1 Create pre-hostility	T = O	

Table A-8

TCT IPB databases for threat countries for a given scenario ("strategic option"). Update, maintain, and use TCT IPB database as real world situation evolves from peacetime to contingency or full wartime footing. (KPP*) Use IPB process, methodology, and product definition based upon Army FM 34-134 and AFJPAM 10-225 pending publication of Air Force Instruction (AFI) on IPB.		
4.1.5.2 Develop and manipulate TCT specific IPB products according to operator instruction to support time critical targeting.	**Threshold**: Support complete products generation on 12 hour cycle; updates every 90 minutes.	**Objective**: Support complete products generation on 8 hour cycle; updates every 60 minutes.
4.1.5.3 Provide new published product notice to the TBMCS network.	T = O	
4.1.5.4 Provide alert or cue to operator for closer scrutiny or decision on further action as individual targets correlate to NAIs or TAIs and JFACC Guidance and ROE. Alert operator as COP composite, automated target recognition, and intel report evidence correlates/fuses to operator selectable threshold for TCT nomination decision.	**Threshold**: Provide operator alert through TCTA-E display on targets approaching or arriving at IPB'd NAI or TAI.	**Objective**: Support operator with correlated or fused evidence accumulation on targets through TCTA-E display and an alert as threshold for TCT nomination is achieved.
4.1.6 Weapon-to-Target Pairing Tool (WTP) [KPP*] Rapidly assess currently available and near-term planned assets, threats, environmental conditions, theater guidance and ROE applicable to the current TCT, then develop and present to the operator for decision the prioritized recommended course(s) of action for countering the TCT.	**Threshold**: 2 minutes or less from target declaration as TCT to presentation of COA options to the operator. System must process a minimum of 25 TCTs at the same time.	**Objective**: 1 minute or less from target declaration as TCT to presentation of COA options to the operator. System must process a minimum of 100 TCTs at the same time.

Table A-9

4.1.6.1 Automated Course of Action (COA) Options Assistance. System must display availability of weapons systems, both immediately available and those forecast in the ATO for a operator defined time parameter that may be employed against a TCT. Must display a recommended prioritization of COAs based on user-defined parameters. Must display on screen as defined by user the weapon or system type (F-15E, B-1, ATACMS, Tomahawk, HH-60G, etc.) and include amplifying data; e.g., entity Call Sign, # platforms (single, 2 or 4-ship), weapons and fuel, mission priority, strike package integrity, etc.	T = O	
4.1.6.2 Weapon-target pairing tool must calculate the following outputs: - Time-on-target (TOT) predictions - Probability of Kill (Pk) - Probability of Survivability (Ps) of the weapon system - Recognize existing Airspace Control Measures (ACMs) impacting COAs - Identify ACMs that need to be implemented in order to complete the attack on the designated TCT	T = O	
4.1.6.3 Automated Tasking Assistance. Create automated tasking messages (9-line format for voice, TADIL J J12 series for datalink) to enable operator tasking to weapon(s) assets with basic target and attack support information. Via	**Threshold:** 1 Minute from presentation of prioritized COAs as described in para 4.1.6.	**Objective:** 30seconds from presetnation of prioritized COAs as described in para 4.1.6.

Table A-10

TBMCS/GCCS interface, distribute tasking message plus collateral track management and asset status messages. WTP must be sufficiently responsive to allow 15 to 30 seconds for operator review of COAs and selection of preferred alternative then disseminate tasking messages within:		
4.1.6.4 Weapon-to-Target pairing data must be integrated real time into the single integrated air picture (SIAP) and resulting Common Operational Picture (COP) for situational awareness.	T = O	
4.1.6.5 System and user must have electronic access to data on current disposition of enemy orders of battle and installations and real- to near- real time notification of status change to TCT for such targets. Furthermore must have electronic access to friendly data such as COP plus ATO, and ACM for asset weapons and fuel status, assigned mission state, etc..	T = O	
4.1.6.6 Additional RTIC Support.Coincident with provisions of para 4.1.6.1 through 4.1.6.5, WTP must interface with ISR Battle Management software to capture data on the feasibility of direct sensor support to assets in weapons COA development. Use ATO and CMP databases to provide callsigns, frequencies, controlling agency, etc. in voice communication; channel numbers or codes for communication of sensor data to shooter; net participation	**Threshold:** Collect and present RTIC support data to C2 operator for evaluation and transmission to appropriate tasked shooter.	**Objective:** Expand upon Threshold requirement to include automated message formatting and transmission to shooter and sensor controller.

Table A-11

group designators for datalink connectivity.		
4.1.7 Launch and Impact Point; Nuclear, Biological, and Chemical (NBC) Dispersion Prediction Tool (LIP/DP) Correlate (T) / Fuse (O) data for accurate TM launch point and impact point predictions for release of agents at altitude from successfully intercepted missiles to detonation of warheads at or near the surface. Generate warning reports and provide interface via TBMCS/GCCS to theater warning dissemination POCs	**Threshold:** correlate multiple launch(es) reports to single track report per missile in [NRT] within [TBD] accuracy error ellipse for operator action in active defense cueing and passive defense warning.	**Objective**: fuse multiple launch(es) reports to single track report per missile in [NRT-] within [TBD-] accuracy error ellipse for automated active defense cueing and passive defense warning.
4.1.8 Joint Target Collaboration and Execution Tool (JTCE) [KPP*] Facilitate rapid joint and coalition collaboration between component commanders or their delegated battle managers for target development plus joint collaboration, coordination, and deconfliction of best course of action option (weapon assignment) among the combined assets available against TCTs.	**Threshold:** Semi-automated visualization and communication (data and voice) between component C2 nodes to determine TCT status of target, show supported commander other component ISR and weapons options, disseminate supported commander's choice of available options.	**Objective:** Automated visualization and voiceless communication (voice as backup) between component C2 nodes to determine TCT status of target, show supported commander optimization of own and other component ISR and weapons options to include deconfliction, disseminate supported commander's choice of available options.

Table A-12

Table B: Information Exchange Requirements Matrix

Event	Information Characterization	Sending Node	Receiving Node	UJTL Number	Critical Y/N	Format	Time	Class
Time Critical Targeting Awareness Enhanced Workstation (TCTA-E) - - COP Display and HSI to other TCT Functionality applications								
All-Source Sensor and INT input, supporting prepared Plans and Orders database information; via ADSI direct, or SAA CSCI by TBMCS WAN, or discrete/dedicated comm hardware								
RT and NRT information for COP Display	GMTI	E-8 JtSTARS	TCTA-E & TCT Server	OP2, OP3, OP6 TA2, TA3, TA5, TA6	Y	Data	RT	Secret
	SAR Imagery	E-8 JtSTARS	TCTA-E & TCT Server	OP2, OP3, OP6 TA2, TA3, TA5, TA6	Y	Data	NRT	Secret
	Other Imagery	TBMCS (IDM)	TCTA-E & TCT Server	OP2, OP3, OP6 TA2, TA3, TA5, TA6	Y	Data	NRT	Secret
	Video	Ground Control Station(s)	TCTA-E & TCT Server	OP2, OP3, OP6 TA2, TA3, TA5, TA6	Y	Data	RT	Secret
	Track & Point Data (aerospace and surface)	TBMCS (SAA)	TCTA-E & TCT Server	OP2, OP3, OP6 TA2, TA3, TA5, TA6	Y	Data	NRT	Secret
	Airspace Control Measures	TBMCS (AODB)	TCTA-E & TCT Server	OP2, OP3, OP6 TA2, TA3, TA5, TA6	Y	Data	RT	Secret
	Mapping Data	TBMCS (APP_ SVC)	TCTA-E & TCT Server	OP2, OP3, OP6 TA2, TA3, TA5, TA6	Y	Data	RT	Secret
Two-way data, voice, link communications support; via TBMCS data and services over TBMCS WAN, or discrete/dedicated comm hardware								
Data access call or "pull"; TBMCS hosted site, TCT server, extra-AOC sources	AODB, MIDB, other non-TBMCS data	TCTA-E	TBMCS APP_ SVC & TCT Server	OP2, OP3, OP6 TA2, TA3, TA5, TA6	Y	Data	NRT	Secret
Data response or "push"; TBMCS hosted site, TCT server, extra-AOC sources	AODB, MIDB, other non-TBMCS data	TBMCS APP_ SVC & TCT Server	TCTA-E	OP2, OP3, OP6 TA2, TA3, TA5, TA6	Y	Data	NRT	Secret
Outbound communication FROM operator and/or TCT	Web, datalink, voice messages and reports; e.g.,	TCTA-E	Other TACS and Service command and asset control	OP2, OP3, OP6 TA2, TA3, TA5, TA6	Y	Text or datalink message;	NRT text and data; RT voice	Secret

Table B-1

Event	Information Characterization	Sending Node	Receiving Node	UJTL Number	Critical Y/N	Format	Time	Class
applications	operator declaration of target as TCT, weapon tasking		nodes; ISR and Weapon assets			voice		
Inbound communication TO operator and/or TCT applications	Web, datalink, voice messages and reports; e.g., TACREPs, TM launch alerts	Other TACS and Service command and asset control nodes; ISR and Weapon assets	TCTA-E	OP2, OP3, OP6 TA2, TA3, TA5, TA6	Y	Text or datalink message; voice	NRT text and data; RT voice	Secret

Table B-2

Area Limitation and Terrain Analysis (ALTA)								
Interface with TCTA-E								
Event	**Information Characterization**	**Sending Node**	**Receiving Node**	**UJTL Number**	**Critical Y/N**	**Format**	**Time**	**Class**
All operator interaction with ALTA	Commands, data and display manipulation, acknowledgments	TCTA-E	ALTA	OP2, OP3 TA2	Y	Data	RT	Unclass
All ALTA activity; operating limitation templates, movement capability projections	Acknowledgments and results for display	ALTA	TCTA-E	OP2, OP3 TA2	Y	Data	RT	Secret
ALTA processing interfaces								
ALTA pulls technical information, terrain limitation and movement data	Target tech data, MC&G, Weather history	TCTA-E	ALTA	OP2, OP3 TA2	Y	Data	NRT	Secret
ALTA calculates and presents terrain limitation and movement analysis	Projected movement and operating area templates	ALTA	TCTA-E	OP2, OP3 TA2	Y	Data	NRT	Secret

Table B-3

Automated TCT IPB (ATIPB)								
Interface with TCTA-E								
Event	**Information Characterization**	**Sending Node**	**Receiving Node**	**UJTL Number**	**Critical Y/N**	**Format**	**Time**	**Class**
All operator interaction with ATIPB	Commands, data and display manipulation, acknowledgments	TCTA-E	ATIPB	OP2, OP3 TA2	Y	Data	RT	Unclass
All ATIPB activity; NAI, TAI, TCT COAs, evidence accumulation threshold	Acknowledgments and results for display	ATIPB	TCTA-E	OP2, OP3 TA2	Y	Data	RT	Secret
ATIPB processing interfaces								
Receive/"pull" processing information for potential TCTs	IPB Products, Intel reports, sanitized SCI reports, enemy COA projections, other TCT related intelligence; specific target or track information as available; Guidance and ROE	TCTA-E	ATIPB	OP2, OP3 TA2	Y	Data Text	NRT	Secret
Operator and application use, generate, or modify TCT specific IPB	IPB Products (NAI, TAI, TCT COAs)	ATIPB	TCTA-E, Other service & coalition nodes, ISR collections manager	OP2, OP3 TA2	Y	Data, Text	NRT	Secret
Application calculates evidence build on specific targets for display on demand; operator alert at predetermined threshold	Evidence accumulation data and threshold alert	ATIPB	TCTA-E, Other service & coalition nodes, ISR collections manager	OP2, OP3 TA2	Y	Data Text	NRT	Secret

Table B-4

Weapon- to-Target Pairing (WTP)

Interface with TCTA-E								
Event	**Information Characterization**	**Sending Node**	**Receiving Node**	**UJTL Number**	**Critical Y/N**	**Format**	**Time**	**Class**
All operator interaction with WTP	Commands, data and display manipulation, acknowledgments, communication FROM other nodes and applications	TCTA-E	WTP	OP3 TA3, TA5, TA6	Y	Data	RT	Secret
All WTP activity weapon COAs; asset tasking support	Acknowledgments and results for display and/or communication	WTP	TCTA-E	OP3 TA3, TA5, TA6	Y	Data	RT	Secret
WTP processing interfaces								
On TCT alert or manual initiation from TCTA-E operator, WTP pulls data for weapon course of action calculation	Target technical details and COA assessments, Friendly assets data, Guidance & ROE, threats to assets, targeting & weaponeering, MC&G, Wx	TCTA-E, JTCE	WTP	OP3 TA3, TA5, TA6	Y	Data	NRT	Secret
WTP calculates aerospace asset course of action options for display	Prioritized friendly COA options for operator selection and tasking	WTP	TCTA-E, JTCE	OP3 TA3, TA5, TA6	Y	Data Text	NRT	Secret
Operator COA decision and tasking of asset(s)	Weapon/ISR asset pairing to TCT Track; J series 9-line , J9, or J12 message, otherwise voice radio transmission	TCTA-E	WTP, JTCE, Other service & coalition nodes, ISR collections manager	OP3 TA3, TA5, TA6	Y	Data Text	NRT	Secret

Table B-5

Launch and Impact Point/NBC Dispersion Prediction (LIP/DP)

Interface with TCTA-E

Event	Information Characterization	Sending Node	Receiving Node	UJTL Number	Critical Y/N	Format	Time	Class
All operator interaction with LIP/DP	Commands, data and display manipulation, acknowledgments	TCTA-E	LIP/DP	OP6 TA2, TA5, TA6	Y	Data	RT	Unclass
All LIP/DP activity	Acknowledgments, menus, results for display	LIP/DP	TCTA-E	OP6 TA2, TA5, TA6	Y	Data	RT	Secret
LIP/DP processing interface								
Launch or missile track reports	DTG, 3-D position , vector, covariance data	TCTA-E	LIP/DP	OP6 TA2, TA5, TA6	Y	Data Text	NRT	Secret
Info pull and calculation of LIP/DP	Threat IPB, MC&G, Wx, MOPP Guidance	TCTA-E	LIP/DP	OP6 TA2, TA5, TA6	Y	Data Text	NRT	Secret
LIP/DP calculates missile launch/impact points; generates dispersion prediction; formats warning message for operator to disseminate	Launch and Impact points; probable dispersion pattern and persistency, warning message format	LIP/DP	TCTA-E	OP6 TA2, TA5, TA6	Y	Data Text	NRT	Secret

Table B-6

Joint Targeting Collaboration and Execution (JTCE)								
JTCE *Interface with TCTA-E*								
Event	**Information Characterization**	**Sending Node**	**Receiving Node**	**UJTL Number**	**Critical Y/N**	**Format**	**Time**	**Class**
All operator and data interaction with JTCE	Commands, data and display manipulation, acknowledgments, communication FROM other nodes and applications	TCTA-E	JTCE	OP2, OP3, OP6 TA2, TA3, TA5, TA6	Y	Data	RT	Secret
All JTCE activity; both target development & weapon coordination	Queries & results for display, communication TO other nodes and applications	JTCE	TCTA-E	OP2, OP3, OP6 TA2, TA3, TA5, TA6	Y	Data	NRT	Secret
JTCE processing interfaces								
JTCE Target Development – *operator designates target of interest*								
Query TO other coalition/joint targeting C2 nodes	Target info as known, request for collaboration to amplify target info	JTCE	Other service & coalition nodes, ISR collections manager; TBMCS	OP2, OP3, OP6 TA2, TA3, TA6	N	Data Text	NRT	Secret
Comeback on query FROM other nodes	Specific target info or situational factors for nominating (or not) as a TCT; ISR options for target exploitation	Other service & coalition nodes, ISR collections manager	JTCE	OP2, OP3, OP6 TA2, TA3, TA6	N	Data Text	NRT	Secret
Query FROM other coalition/joint targeting C2 node(s)	Target info as known, request for collaboration to amplify target info	Other service & coalition nodes, ISR collections manager	JTCE	OP2, OP3, OP6 TA2, TA3, TA6	N	Data Text	NRT	Secret
Response TO query from other node(s)	Specific target info or situational factors for nominating (or not) as a TCT; ISR options for target	JTCE	Other service & coalition nodes, ISR collections manager; TBMCS	OP2, OP3, OP6 TA2, TA3, TA6	N	Data Text	NRT	Secret

Table B-7

exploitation | | | | | | | | |

JTCE Weapon Assignment – *system TCT alert or operator manual initiation on selected target*								
Query TO other coalition/joint weapon C2 nodes	Request for attack weapon nomination; ISR options for BDA	JTCE	Other service & coalition nodes, ISR collections manager	OP2, OP3, OP6 TA2, TA3, TA5, TA6	Y	Data Text	NRT	S
Comeback on query FROM other nodes	Weapon(s) & ISR nominations, time on target (TOT), deconfliction requirement	Other service & coalition nodes, ISR collections manager, WTP	JTCE	OP2, OP3, OP6 TA2, TA3, TA5, TA6	Y	Data Text	NRT	S
Operator tasks weapon from JTCE optimization of weapons available	Message: datalink, text, voice	JTCE	Other service & coalition nodes, ISR collections manager, WTP	OP2, OP3, OP6 TA2, TA3, TA5, TA6	Y	Data Text	NRT	S
Query FROM other coalition/joint weapons C2 nodes	Request for attack weapon nomination; ISR options for BDA	Other service & coalition nodes	JTCE, WTP	OP2, OP3, OP6 TA2, TA3, TA5, TA6	Y	Data Text	NRT	S
Response TO query from other node(s)	Weapon(s) & ISR nominations, time on target (TOT), deconfliction requirement	WTP, JTCE	Other service & coalition nodes	OP2, OP3, OP6 TA2, TA3, TA5, TA6	Y	Data Text	NRT	S

Table B-8